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Update:
INTERNATIONAL PRODUCTIVITY COMPARISONS
Economies, Sectors, Manufacturing Industry Groups:

Levels and Trends in Output per Hour
and
Multiple-Input Comparisons, U.S./Japan

By

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PREFACE AND ACKNOWLEDGEMENTS

by C. Jackson Grayson, Jr.

The American Productivity Center is delighted to provide comparatively current data presenting new insights on the internal productivity dynamics of the United States and Japan, for the span 1970-83, with some spot updating to 1984 or 1985.

We tender our sincere thanks to the Japan Productivity Center and Dr. Sasaki, who provided the basic data for the Japanese input for this comparison. Thanks also are merited by our contractor for the American Productivity Center multiple input data service, Dr. Elliott H. Grossman, Professor at Pace University, who matched the U.S. input data against that for Japan to provide the basic data series for this report.

The American Productivity Center's retired Senior Economist, George E. Sadler, formulated the plan for the study, calculated the relevant growth rates, and prepared the analytical text and tables for the article.

We present this study to you convinced that it offers data of outstanding significance to analysts of international economic growth and comparative efficiencies. For the first time, this article provides relatively current data on the internal productivity dynamics of the individual major sectors within the U.S. and Japanese economies, and of the industry groups within the manufacturing sectors, which are of outstanding importance in international trade.

We feel that this new data provides a much sounder base for projections of future output growth and productivity trends for the U.S. and Japan, and with the ancillary data we provide, for leading European nations also. The detailed analysis of multiple-input productivity trends and of the levels of labor productivity for the sectors and manufacturing industries provides a truer picture of the internal dynamics of both nations. It also provides warning flags to major manufacturing industries of the U.S. and Western Europe as to the need for urgent action to accelerate their productivity, to cope with the tremendous gains by Japan in industries such as electrical machinery, chemicals, transportation equipment, and primary metals, which are so important in world trade.

Of perhaps equal importance, it shows clearly that the weaker segments of the Japanese economy -- which motivate against its early takeover of leadership in national levels of productivity -- are those of primary significance to the Japanese internal market -- transportation, personal and business services, agriculture, and trade (especially retail trade, where cultural traditions motivate against achieving "modernized" and more highly productive practices). Low productivity in these segments of the economy does not exert much effect upon Japan's extraordinary capability to compete in the international market for fabricated goods. It does, however, lay a heavy current burden on the average Japanese citizen, in terms of high cost of living and the unavailability of adequate housing to match the living standards of not only the U.S. but also many other less-favored nations. Perhaps in ~~time, some~~ of these limitations may be overcome -- but Japanese statesmen are themselves the first to emphasize the problems inherent in

Japan's limited natural resources, with little land room for expansion and much of it mountainous, difficult terrain.

Nevertheless, the Japanese international trade outlook is bright, and other leading industrial nations must devote intensified efforts to achieve more effectiveness in production -- and perhaps even more, greatly increased sales/distribution capabilities.

UPDATE:

MULTIPLE-INPUT PRODUCTIVITY COMPARISONS OF TRENDS

AND LABOR PRODUCTIVITY LEVELS, 1970-83, U.S. AND JAPAN

(With Supporting Background Data on Six Major

Industrial Nations for the Span 1950-84)

INTRODUCTORY NOTE:

This analysis was triggered by an update of the American Productivity Center's multiple-input productivity comparison of the U.S. and Japan, utilizing Japanese data provided by the Japan Productivity Center. We have also capitalized upon a significant amount of labor productivity data through calendar year 1984 for Canada, France, Germany, and the United Kingdom -- in addition to Japan and the U.S. -- for the national economies, business activities, and the important manufacturing sector. (Unfortunately, however, we have found that reliable, comparable data on sector output per manhour for recent years are available only for the U.S. and Japan.)[1]

[1] TECHNICAL NOTE: First, we must emphasize that the multiple-input data available for our Japan/U.S. comparison, based on the Kendrick approach, was compiled prior to the 1980 Census benchmark revision, and the re-basing of the series. Hence, our trend data may deviate a bit from those published by the BLS, the Japan Productivity Center, et. al. which are using the revised Benchmark. (The differences, however, are probably not major.)

Second, we have bewailed limitations on economic analysis due to the unavailability of reliable comparable output per manhour and multiple-input series for the major sectors of the industrial nation's economies. With helpful input from the U.S. Bureau of Labor Statistics, the JPC, the OECD and others, we have tried to fill the gap, but without success. Most labor productivity data available relates to output per capita, or per employee. We have noted that with the major differences in annual hours per worker, especially between Japan and the U.S., Canada, France, Germany and especially Italy, per employee productivity ratios are not comparable to per hour data. We hope this data gap may eventually be filled.

We analyze in the following sections the productivity performance of the United States and Japan during the turbulent decade of the 70's and their somewhat staggering move forward in the early years of the 80's. Our analysis indicates that productivity progress for the major segments of the economies was at best a mixed bag, as a result of the OPEC-II induced recession of 1980-82, but with Japan continuing, for the most part, more rapid productivity gains noted in earlier postwar decades. For sound perspective, we now present highlight data on postwar trends of labor productivity for six major OECD-member nations.

BACKGROUND: POST-WORLD WAR II PRODUCTIVITY DYNAMICS

We highlight herein results of the numerous sound analyses of postwar productivity patterns for the leading industrial nations by the U.S. Bureau of Labor Statistics, Dr. Angus Maddison (formerly a Division Chief of OECD), Dr. John Kendrick, the World Bank, and the American and Japanese Productivity Centers, as well as others. The data we have gleaned appears in Table 1 below. Certain basic facts emerge with unmistakable clarity:

1. In the two post-World War II decades, as well as the early years of the third, Japan, Germany, France, Italy, and some of the smaller European nations made truly unprecedented gains in both national output and in productivity. During the same span, the U.S., Canada, and the U.K. trudged along with modest productivity gains, differing little from the pattern of the earlier decades of the twentieth century.

2. After the first OPEC shock of 1973, the rapid growth rates of output and productivity were choked off, as the unprecedented economic stresses of the energy crisis and the accompanying world financial distress plunged the world into a deep recession, with halting and uneven recovery in late 1975 and in 1976, the timing varying from nation to nation.

3. Even in this period of worldwide economic distress, however, while the United States and Canada were bumbling along with almost no real growth in productivity and only modest rises in real output, Japan, Germany, and France continued to make significant improvements in productivity, especially for the manufacturing sector. During the eight-year span 1973-81, Japan recorded productivity growth rates in manufacturing nearly four times that of the U.S. and three times the rates of Canada and the U.K.

4. During the most recent span for which comparable data are available (1981-84), productivity growth rates for the economies of all six leading nations were significantly lower than the averages of the pre-OPEC years. Japan slowed to a 3.0 percent per year rate for the economy and 5.0 percent per year for the business segment, rates still above other nations. For the manufacturing sector, however, all the nations in the group exceeded the pace of the earlier post-OPEC years, with annual productivity growth rates ranging from Japan's 6.2 percent per year to 4.6 percent per year for the U.S. and 2.3 percent per year for Canada (Table 1).

Table 1

Post-World War II Productivity Growth Rates
for Six Leading Industrial Nations

Average Annual Percent of Change in Output Per Hour
for

Nation	Domestic Economy				Business Economy				Manufacturing [1]			
	1950-60	1960-73	1973-81	1981-84	1950-60	1960-73	1973-81	1981-84	1950-60	1960-73	1973-81	1981-84
U.S.	2.3	2.6	1.1	1.9	3.2	3.1	0.8	1.4	2.0	3.2	1.3	4.6
Canada	3.1	3.0	0.5	1.0	3.4	4.2	0.5	-	3.8	4.7	1.6	2.3
Japan	5.7	9.3	3.3	3.0	6.9	9.9	3.7	5.0	9.5	10.3	5.5	6.2
France	4.4	5.5	3.3	2.1	4.7	5.9	3.7	-	4.9	6.5	4.4	5.3
Germany	6.9	5.4	3.7	2.2	7.0	5.8	3.7	-	7.4	5.8	3.5	4.1
U.K.	2.2	3.9	2.9	3.0	2.2	3.8	2.3	-	2.0	4.3	1.6	5.5

[1] Data for manufacturing are not strictly comparable with that for the total domestic economies and for the business economies in this and in some of the other tables in our analysis, since they have been changed to reflect the revisions introduced in the BLS release "Output per hour, hourly compensation and unit labor costs in manufacturing, twelve countries, 1950-84." March, 1986.

Source: George E. Sadler, for the American Productivity Center. (Basic data from Angus Maddison, John F. Kendrick, U.S. Bureau of Labor Statistics, and Japan Productivity Center.)

In analyzing the labor productivity experience of the leading industrial nations of Western Europe and Japan during the first three and a half decades after World War II, two basic facts of outstanding significance must be kept in perspective:

1. At the end of World War II, productivity of the U.S. economy towered above that of all the other nations, partly because it shared with Canada the absence of wartime disruption of the industrial community, but also because it had become -- both during the war years and in the preceding decade -- the leader in science and manufacturing technology. Also, while there remains some dispute on the subject, the U.S. was generally conceded the world leadership in managerial skills and know-how.

2. During the 1950's and the early 60's, under the several programs of financial and economic aid and technical assistance, the United States transferred to the nations of Western Europe, Latin America, East Asia, South Asia, and Africa the largest and most sustained flow of development funding and scientific/technical/managerial know-how, product design, and product/processing technique in the recorded history of the modern world. Accompanying the flow of development funding was the large-scale training of overseas nationals in the United States, the dispatch of thousands of U.S. industrial experts -- in all fields -- to overseas nations, upon request through regional and/or individual countries, and a continuing flow of the so-called "technical aids" in which U.S. know-how was transferred through books, studies and pamphlets, visuals, and answers to

individual inquiries.

In this program, the U.S. assisted friendly nations also in the formation of effective regional and individual-country knowledge dissemination programs, not only in industry but also in health, education, labor organizations, public administration, agriculture, and community development. Many of these organizations in due course disappeared when U.S. aid was curtailed and/or when their tasks were largely accomplished. A large number, however, are continued into the present era as fundamental regional entities -- e.g., the OECD (the successor to the European Productivity Agency); the Asian Productivity Organization, with its 14-country national developmental entities; and other national centers working in various segments of the economy.

The size of the 1950 productivity differentials between the U.S. and other leading Western industrial nations is perhaps best shown in Angus Maddison's valuable work on structuring measures of output per hour for the national economies of some 16 industrial nations, and the Bureau of Labor Statistics' still unpublished computations on national output, population, employment, and output per capita and per employee. (The BLS does not compute output per hour series for the economy, though it does produce a 12-nation series on labor productivity and cost trends -- not levels -- for the manufacturing sectors.)

Similarly, the varying pace of "catch-up" of the U.S. productivity level by Japan and the leading Western European nations can be noted not only in our

Table 1 but perhaps even more clearly in our Table 2, showing estimated levels of output per hour for the economies and for the important manufacturing sector.

Table 2

Estimated Levels of Labor Productivity
in the Economies and Manufacturing Sector
of the Six Leading Nations, Relative to the U.S.
1950, 73, 81, and 84

	Real Output, National Economy								Manufacturing Sector			
	Per Hour[1]				Per Employee[2]				(Output per hour)[3]			
Nation	1950	73	81	84	1950	73	81	84	1950	73	81	84
U.S. (75$)	5.91	8.38	10.89	11.59	(not available)				5.12	9.30	10.50	11.72
Re. Index	100	100	100	100	100	100	100	100	100	100	100	100
Japan	14	50	58	60	17	55	70	74	11.3	55.1	82.7	92.1
Canada	78	94	90	91	84	96	98	99	51.8	77.0	77.8	74.6
Germany	36	78	96	96	38	74	89	92	33.4	78.0	80.6	81.4
U.K.	59	68	78	81	58	66	72	75	40.8	47.5	40.0	42.0

1. Data on real output per hour for the national economy, in constant 1975 U.S. dollars, and market exchange equivalents, with an adjustment for purchasing power parity. Basic data from Angus Maddison's series, with some extensions by Sadler.

2. Data on real output per employee for the national economy, in constant 1975 U.S. dollars, as an "average OECD market exchange rate," with purchasing power parity and adjustments. Data source, U.S. Bureau of Labor Statistics unpublished data. While Kurosawa has made estimates of levels, the results may not be comparable with the BLS series used.

3. Data on real output per hour for the manufacturing sector primarily from the American Productivity Center's Japan/U.S. multiple-input comparison series, coupled with past and currently published U.S. Bureau of Labor Statistics data on trends, insofar as appears relatively comparable. NOTE: Reliable level data for the manufacturing sector (as for the other major sectors of the economies) is hard to come by. Hence, these estimates may be questionable, except for the "firm" U.S. dollar and equivalent estimates for the U.S. and Japan for the years 1970-83. Some recourse was made to data generated by Dr. Kurosawa for the JPC/OECD International Productivity Symposium in Tokyo, 1983.

Source: George E. Sadler, for the American Productivity Center

A number of experts -- and the author -- have in past years calculated that at least two European nations (France and Germany) would overtake the U.S. level of national productivity by calendar year 1986 or 1987. France and Germany have approached the U.S. national levels of output per hour in 1984, and Canada was estimated by the BLS at 99 percent of output per employee in the U.S. economy. However, the requisite data are lacking to establish whether or not any nation has clearly forged above the productivity of the U.S. economy by early 1986.[2]

However, if past growth rates at the levels of the national economy, business activity, and the manufacturing sector continue, in future years, the U.S. era of world productivity leadership will certainly end; and France or Germany will lead the industrial pack.

Perhaps an even more severe threat to U.S. leadership appears for the manufacturing sector, which is so important in the import/export relationship and the national balance of payments. By 1984, the American Productivity Center's Japan/U.S. series (projected from 1983) showed Japan at a level of 92 percent of the U.S., well ahead of any of the European productivity leaders. The BLS and Japan Productivity Center estimates of 1985 growth of manufacturing productivity -- though perhaps not entirely comparable -- show Japan's rate of improvement noticeably stronger than that of the U.S. Presumably, the difference will continue unless the weakening of the dollar

2 Since international comparisons of level of productivity are inevitably affected by shifts in the international currency market unrelated to total productivity, the comparisons are at best questionable in a very close race.

improves the competitive capability of U.S. manufacturers enough to allow a sharp increase in exports -- and hence in utilization of manufacturing plant capacity.

In any event, as spelled out in following pages, Japan has already forged strongly ahead of the U.S. productivity level for three major manufacturing industry groups (chemicals, primary metals, and electrical machinery) and slightly ahead in the transportation equipment group.

A significant facet of national productivity performance, frequently overlooked, is the prevalence of divergences in the performance of individual sectors of the economy coupled with the inter-industry divergences within sectors.

The American Productivity Center's multiple-input comparisons for the U.S. and Japan covering 1970-83 clearly show the scale of inter-sectoral, inter-industry differences. The valuable work on output per employee (levels and trends) by Dr. Kurosawa for the span 1970-79 showed the pattern of divergences for the U.S., Japan, the U.K., France, Germany, Belgium, and several of the East Asian nations.

International productivity comparisons for individual industries began with the pioneering work of Latzo Rostas in 1939; and intermittent studies since then have revealed the same pattern of large inter-industry differences both within the same nation and for the same industries between different nations.

Such differences appear greater in Japan than in any other major nation. Thus, despite an outstanding performance in the manufacturing sector, Japan is unlikely to threaten the national productivity "leadership" of the U.S. (or France or Germany). As noted in more detail in following sections, Japan's problem is very low levels of output per employee or per hour in agriculture, trade, transportation, and business/personal services.

MULTIPLE-INPUT PRODUCTIVITY PATTERNS, 1970-80 and 1980-83, U.S.-JAPAN

The Private Business Economies

As in earlier years studied, the dynamics of output, inputs, and the productivity measures for the business economies of the U.S. and Japan during the decade of the 1970's and the early years of the 1980's were distressingly different, from the viewpoint of the U.S. businessman. Japan enjoyed a strong comparative edge in growth rates of real output and productivity, except for the period 1980-83 when both nations showed a dismal, nearly no-growth pace for total factor productivity (U.S. 0.4 percent and Japan 0.6 percent per year). John Kendrick's 1981 analysis for nine OECD nations, in fact, showed Japan by far the leader in both output and productivity growth for 1960-73 and 1973-79, with the U.S., the U.K., and Sweden sharing the onus of the poorest growth rates.

3 See "International Comparisons of Productivity Trends," by John Kendrick, published in the American Enterprise Institute's "Essays in Contemporary Economic Problems: Demand, Productivity and Population." 1981

In every long and short-term span for which comparable data are available, our series (as well as those of Kendrick and others) show a strong correlation between output growth and labor productivity improvement, for both the U.S. and Japan. This relationship was noted and appraised by Kendrick in his comparison of output and productivity growth for nine OECD member nations for the spans 1960-73 and 1973-79.[3] His data showed a correlation of R^2=.6496 for the average of the nine countries for the span [illegible]73. Our data for Japan and the U.S. show labor productivity growth virtu[illegible]ly mirroring the trend for output in all spans analyzed.

While there is certainly some relationship, the average annual growth rates of total factor productivity have not tracked the rate of output growth in most spans. In some periods, U.S. total factor productivity has declined despite growth in real output.

A look at the trends for "capital productivity" (the relationship in trends in capital input and in real output) have shown significant negative relationships for both the U.S. and Japan in some recent periods. This reflects statistically the reality of the substantial outlays made for improvements in the capital stock of the industry of both nations, which made possible the strong increases in real output and in labor productivity. (Such improvements, by definition, include not only the addition of new and efficient plants, but also the retirement of older machinery and its replacement with newer "state of the art" equipment and machinery, accompanied by recent innovations such as computer aided controls and computer aided design of product and process.) Hence, even though "capital productivity" trends may seem small or even negative, this most likely does not mean poor

managerial decisions. More likely, it reflects the inevitable transitional cost of achieving targeted long- and short-term gains in output, market share, and in labor productivity.

During the decade of the 60's and in 1970-73, prior to the OPEC oil shock and the attendant worldwide recession of 1974-75, Japan's business economy set new world standards -- average of 9 to 11 percent per year growth rates in real output and in labor productivity -- never before envisioned and never since equaled; and perhaps they never will be in the future. Similarly, Japan's improvements in total factor productivity set new world growth standards at over 6 percent per year, despite almost unbelievably rapid increases in the average annual growth rate of capital inputs (according to Kendrick, 10.9 per year for 1960-73, and 6.4 percent per year in the uncertain span of 1973-79). As might be expected, Japan's growth rate in "capital productivity" was not outstanding, with a positive 0.1 percent per year pace in 1960-73, and a negative 2.4 percent per year for the decade 1973-83. The following special tabulation demonstrates the patterns.

Growth Rates in Real Output,
Total Factor, Labor and Capital Productivities,
Private Business Economies, Japan and U.S.
(Selected periods, 1960-83)

	Average Annual Percents of Change In:							
	Real Output		Total Factor[1]		O/Unit Labor		O/Unit Capital	
	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.
Kendrick:[2]								
1960-73	10.8	4.4	6.6	1.9	9.9	3.1	0.1	-0.1
APC:								
1970-73	9.1	5.6	5.2	2.7	8.9	3.3	-2.7	1.7
73-79	3.7	2.4	0.8	-0.2	3.5	0.4	-3.1	-1.1
79-83	4.9	0.7	1.4	-0.2	3.9	1.0	-1.4	-2.2

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1 Real output per unit of weighted labor and capital input -- "Total Factor Productivity."

2 See "International Comparisons of Productivity Trends," by John Kendrick, published in Essays in Contemporary Economic Problems: Demand, Productivity and Population, American Enterprise Institute for Public Policy Research, Washington, D.C., 1981.

The data we have available indicate two facts of more than passing significance in analyzing national growth and productivity trends:

1. In the six post-OPEC I years (1973-79), despite a nearly 100 percent dependency on imported oil (or in part because of it), Japan performed near-miracles in adapting products/processes, machinery, and equipment to maximize energy saving and utilization of alternative sources of energy. This context is reflected in the tremendous input of capital in the 1973-79 span, as well as in the post-OPEC II span 1979-83. The results of these efforts appear visibly in the continuing pattern of growth in real output and in labor productivity for all private business as well as for the important manufacturing sector, which is covered later in this article. Important strides were made in energy substitution and energy conservation in key industries -- perhaps most notably in steel production -- where Japan blazed trails the U.S. and other nations are now following. These actions, of course, required truly major inputs of capital for research and development and new equipment and materials.

2. As a direct result of the strong rises in real output and in labor productivity in the past three decades, the business economy of Japan has forged ahead in the world race for productivity leadership to a surprising degree. According to our best estimates based on available data, Japan's output per hour of the private business economy was the Yen equivalent of U.S. 74$ 6.64 per hour in 1983, more than two-thirds the U.S. level. In sharp contrast, comparable figures for 1960 show Japan at under 30 percent of the U.S.; for 1970, about 43 percent; and in 1973, about 50.5 percent (Table 3).

Goods Producing and Services Industries Segments

Much has been written in U.S. developmental economics circles about the rapid transition of the U.S. economy from a primarily goods-generating economy to a services-dominated economy. Highlighting such comment has been the very large loss of markets, output, and employment in the important manufacturing sectors (which in some observers' minds seems to appear virtually the entirety of U.S. goods production). In the absence in past years of detailed information on levels and trends in productivity for the major sectors of the economy, the conventional "wisdom" seems to have been that the decline in the goods-production segment carried with it a severe loss in productivity for the entire business economy, since service operations were tagged with a "low productivity" label by many economists.

However, the availability of current data on both levels and trends in productivity for the individual sectors and their combination into aggregates for the goods and services segments through the American Productivity Center's multiple-input productivity data service for the years 1970-83 demonstrated the fallacy of this line of argument. At the beginning of the 70's, the aggregate for the services sector showed an absolute level of labor productivity (real output per hour) a bit higher than that for the goods industries. This situation prevailed through most of the 1970's. By 1983, however, our data show a slight lead in output per hour for the goods producing aggregate, due to the services segment's lag in productivity gains, particularly in the years of depression following the second OPEC price shock of 1979.

During the full span 1970-83, for the U.S. the goods industries declined from 44 percent of total private business to a terminal of 40 percent in 1983. In Japan, however, the reverse was true: goods producers' percentage of the business economy output in 1970 was a strong 50.4 percent, while in 1983 the goods total was 52 percent, compared to 48 percent for the services industries. This growth in preparation of goods-to-services output was traceable primarily to the extremely strong output increase for Japanese manufacturing, which rose from a percentage of 32.7 in 1970 to 41.1 percent of total private business in 1983. (In the U.S., the manufacturing sectors' share of business output declined from 29.9 percent in 1970 to 29.0 percent in 1983.)

As is shown clearly in our Table 3, average annual total factor productivity gains for U.S. goods and services industries were very nearly the same. For labor productivity, however, the goods producers had significantly stronger average annual gains than the services segment. As a result, constant dollar output per hour for the goods segment rose from $8.24 in 1970 to $10.21 in 1983, compared to $8.52 (1970) and $9.74 (1983) for the services.

For Japan, the goods producers' labor productivity level in 1983 was $7.03, a sharp contrast to the estimated $3.14 in 1970. The Japanese services segment whose average value equivalent of 1975 U.S. dollars was $4.20 in 1970 (above the level of the goods segment) rose only to $6.26 in 1983, despite very strong gains in two individual sectors (utilities and the finance/insurance industries).

Table 3
Update: Comparative Output and Productivity Patterns,
U.S. and Japan, 1970-83, for the
Private Business Economy and Major Sectors

Segment & Sector of Economy	UNITED STATES								JAPAN							
	Avg. Ann. % Change in:						Level of:		Avg. Ann. % Change in:						Level of	
	Output		TFP		Output/Hr.		Output/Hr[1]		Output		TFP		Output/Hr.		Output/Hr.	
	70-80	80-83	70-80	80-83	70-80	80-83	1970 (In U.S. 75$)	1983 (In U.S. 75$)	70-80	80-83	70-80	80-83	70-80	80-83	1970-	1983
Private Business Economy	2.9	1.4	0.5	0.4	1.2	1.6	8.33	9.79	5.6	4.1	2.4	0.6	5.4	3.0	3.59	6.64
Goods Producing Industry	2.3	0.0	0.6	0.4	1.5	2.2	8.24	10.21	5.7	5.1	3.6	2.4	6.8	5.0	3.14	7.03
Agriculture	1.3	0.7	-1.5	-0.4	1.4	-1.0	6.08	6.80	0.2	0.7	-5.0	-3.7	5.7	1.4	1.37	2.48
Mining	1.3	-0.9	-2.8	-1.1	-3.8	-0.1	27.58	18.61	2.3	0.6	4.1	2.8	7.8	6.2	5.07	12.83
Construction	-0.2	-1.3	-2.6	0.6	-2.7	0.9	9.45	7.40	3.2	2.2	-1.4	-4.0	0.6	-1.4	3.85	3.92
Manufacturing	3.0	0.3	1.7	1.3	2.5	3.1	7.92	11.17	7.2	7.0	5.1	4.1	7.7	6.2	3.91	9.82
Service Industries:	3.4	2.3	0.4	0.4	0.9	1.2	8.62	9.74	5.6	3.0	1.4	-0.6	3.8	1.0	4.20	6.26
Trans. & Comm.	4.3	0.4	2.7	1.2	3.2	2.7	9.29	13.79	4.8	0.6	3.0	-0.3	3.7	0.4	3.86	5.64
Elec., Gas, Water	2.9	1.5	-0.8	-1.4	1.2	-0.2	21.98	24.64	3.9	5.8	-0.9	2.7	2.3	6.7	14.01	21.40
Trade	3.4	2.7	1.0	1.8	1.6	2.8	6.88	8.77	6.2	1.4	2.8	-1.2	5.1	0.5	2.88	4.81
Finance, Ins.	3.5	2.1	-0.4	-1.7	0.2	-0.2	8.21	8.29	8.1	8.5	4.3	5.8	6.0	7.1	6.69	14.72
Real Estate	3.8	-0.7	1.6	-2.0	-0.5	-2.7	2	2	7.1	3.8	-1.7	-3.4	1.0	-3.2	2	2
Bus. & Prof. Servs.	2.7	4.4	-1.0	1.3	-1.0	1.2	7.50	7.03	3.5	5.1	-2.6	6.0	0.7	-1.3	3.39	3.49

1 Level of output per hour expressed in terms of constant U.S. 1975 dollars, and in the case of Japan, 1975 Yen converted to 1975 U.S. dollar equivalents. Obviously, if the expression were in terms of 1986 Yen per dollar ratios, the Japanese output per hour level would be substantially higher than the above and to the stronger dollar in exchange. In the case of the manufacturing sector, the 1983 level for Japan would be higher than that of the U.S.

2 The hours input estimates are not deemed sufficiently reliable for level purposes, though they serve satisfactorily for trend analysis.

Source: George E. Sadler, for the American Productivity Center.
Basic Data: APC's U.S./Japan multiple input service, with Japanese input by the Japan Productivity Center.

In terms of Japan's average 1983 output per hour levels compared to the peer groups in the U.S., Japanese goods producers were at a level of 68.9 percent of the U.S. goods segment, while Japanese service industries were 64.3 percent.

Just as for the entire private business economy, Japan's growth rates in labor productivity and total factor productivity were far stronger in the decade 1970-80 for both the goods and services segments than those for the United States (roughly three times as much for goods industries and four times as much for service industries).

During the recession-plagued early years of the 1980's, however, the pattern was mixed: while the average growth rate for Japan's goods producers was still a modestly strong rise of 2.4 percent in total factor and 5.0 percent in labor productivity, services segment averages were -0.6 percent per year in total factor and +1.0 percent per year in labor productivity. This is a sharp contrast to the U.S. pattern: goods industries, 2.2 percent per year labor and 0.4 percent total factor productivity; services industries, 1.2 percent per year labor and 0.4 percent total factor productivity -- both small but positive growth rates.

In the following section, we analyze in some detail the pattern of productivity dynamics for the individual sectors of the Japanese and U.S. business economies.

PRODUCTIVITY DYNAMICS FOR INDIVIDUAL SECTORS OF THE ECONOMY

A. Trends

The analysis of the productivity patterns for the individual sectors of the two economies show not only the variation within each nation, but also the more significant difference between the two economies in both their divergence in growth rates and in the levels of estimated output per hour, especially by our terminal year 1983.

In terms of productivity growth rates, two U.S. goods sectors (mining and construction) showed substantial declines in the decade of the 70's in both labor and total factor productivity, ranging from -2.6 percent to -3.8 percent. A third sector (agriculture) recorded modest losses in total factor productivity for both 70-80 and 80-83; and a modest loss in labor productivity in 80-83. The only productivity gains for these three goods sectors were in 80-83 for construction, 0.6 percent total factor productivity and 0.9 percent in labor productivity; and in 1970-80 for agriculture, 1.4 percent output per hour. Hence, as surprising as it may seem, the only productivity gains for the goods industries during 1970-83 were in manufacturing (ranging up to 3.1 percent per year in 1980-83 for labor productivity, despite the 1980-82 recession).

For the U.S. service industry sectors, reasonably good gains in both total factor and labor productivity were recorded by the transportation and communications industry group, in both 70-80 and in 80-83, ranging to 3.2 percent per year, with gains naturally stronger in labor than in total factor

productivity. Gains were stronger in 70-80 than in 80-83. The wholesale and retail trade industries recorded modest gains throughout the 13-year span, ranging up to 2.8 percent per year in 80-83. The public utilities group, which had been strong leaders in productivity in earlier years, actually experienced modest declines in total factor productivity in both the 70's and in 80-83; and a very slight rise in labor productivity in the 70's followed by a minuscule loss in 80-83.

The remaining three industry groups in our comparison -- finance and insurance, real estate, and business and professional services, recorded generally unfavorable productivity growth rates both in the 70's and in 80-83, the only significant exception being very slight increases in 1980-83 of just over 1 percent per year for business services.

For Japan, the inter-sectoral dynamics pattern was entirely dissimilar, and there was a much larger range in the growth and loss percentages than in the case of the United States -- as we commented briefly in earlier sections.

- For the decade 70-80, total factor productivity gains were 5.1 percent for manufacturing; 4.1 percent for mining; 4.3 percent for finance/insurance; 3.0 percent for transportation/communications; and 2.8 percent for trade. Total factor productivity annual declines for the 70's ranged from -0.9 percent for utilities and -1.4 percent and -1.7 percent for construction and real estate, upward to -2.6 percent and -5.0 percent for the troublesome Japanese sectors business and professional services and agriculture.

- Also for the decade 1970-80, the divergence in labor productivity was still formidable, but trends were most positive and the negatives not present, reflecting the positive results of the large Japanese inputs of capital per unit of output: gains ranged from average annual growth rates percentages of 7.8 percent for mining and 7.7 percent per year for manufacturing downward to less than 1 percent for construction and for business/professional services.

- For the post-OPEC II recessionary years through 1983, total factor productivity trends for Japan were even more divergent than in the decade of the 70's, ranging from good gains of 5.8 percent per year for finance/insurance activities and 4.1 percent for manufacturing downward to negative rates of from -1.2 percent per year for trade, -3.7 percent for agriculture, -4.0 percent for construction to -6.0 percent per year for business/professional services. (Note that capital input per unit of output was very heavy in some sectors, leading to heavy losses of capital productivity, ranging in 1970-80 up to -7.0 percent per year for agriculture, -7.8 percent for construction, and -9.6 percent per year for business/professional services, according to Japan Productivity Center basic data. For 80-83, capital productivity losses ranged up to -8.9 percent per year for construction and -10.6 percent per year for business/professional services.)

- The varied pattern of very slight to very strong gains in output for the several sectors of the Japanese post-OPEC II economy, coupled with the variegated pattern of capital productivity, led to an

extremely diversified pattern of labor productivity: gains of 7.1 percent per year for finance and insurance activities, of 6.2 percent per year for manufacturing and for mining and the public utilities contrasted sharply with labor productivity losses ranging up to -3.2 percent per year for real estate, and -1.4 percent per year for construction.

B. Levels of Labor Productivity, Sectors

The dramatic differences in estimated constant dollar levels of labor productivity between the sectors in both the U.S. and Japan are clearly evident in our Table 3 (data based on constant U.S. 75$, and the yen equivalents of U.S. 75$ at the 1975 exchange rate--272.5 yen to the U.S. dollar). Even more startling are the comparisons of U.S. and Japan levels for the industrial sectors, especially by the terminal year of our comparison, 1983.

For the U.S., in 1983, four U.S. sectors recorded a labor productivity level over $10.00 per hour: electric, gas, and water utilities, $24.64; mining, $18.61 (down from $27.58 in 1970); transportation/communication sectors average, $13.79; and manufacturing at $11.17. The low sectors for the U.S. in 1970 were construction, $7.40; and business/professional services, $7.03.

For Japan, in sharpest contrast, the problem sectors were, in 1983, agriculture, $2.48 per hour, equivalent; business and professional services,

$3.49; construction, $3.92; and trade, $4.81 per hour. However, Japan's "better" sectors were infinitely more productive; the utilities, $21.40 per hour -- almost up to the high U.S. level; mining, $12.83--below the U.S. level but still a high-productivity figure; and the important manufacturing sector at $9.82 U.S. 75$. This level, it is worthy of note, was 88 percent of the U.S. level, at 1975 constant dollar equivalents. Data available from the Japan Productivity Center and U.S. Bureau of Labor Statistics trends for manufacturing industry through 1985, projected against our American Productivity Center series 1983 levels, indicate Japanese manufacturing output per hour had reached an equivalent of $11.26 constant 74$ U.S., almost 94 percent of the U.S. estimated level of $12.04.

It is relevant to note, however, that these are all constant 1975 dollar and yen equivalents, converted at 272.5 per U.S. dollar. If the constant currency base were shifted to 1986, circa late April, with the yen/dollar rate at under 170, the "productivity level" relationship would be entirely changed, with the Japanese manufacturing sector very far ahead of the United States.[4]

In comparing the U.S. and Japanese output per hour levels for 1983 against the earlier years, it is worth noting how far rapid gains in productivity for key sectors moved in the "catch-up" process -- especially for

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4 We have not carried out the mathematical gymnastics requisite to making a comparison converted to 1986 yen/U.S. dollar equivalents. The reader could do so by adjusting the value of the 1985 U.S.$ level upward to reflect the inflationary escalation of the GNP deflator for manufacturing, and relating that to the Japanese estimated U.S.$ equivalent, taking into account low Japanese inflation plus the currency exchange rate.

the manufacturing sector, where Japan was in 1970 only 49.4 percent of the U.S. manufacturing industry level. Similarly, in the utilities sector, Japan's 1970 level was only 63.7 percent that of the U.S.; but in 1983, 86.9 percent. The topper, however, was in the finance and insurance sector activities, where Japan in 1970 was 81.5 percent of the U.S. labor productivity level; but in 1983, a full 177.6 percent of the U.S. level.

PRODUCTIVITY DYNAMICS FOR MANUFACTURING INDUSTRY GROUPS

A. Trends: U.S.

There was significant diversity in the United States business economy in both levels and trends of productivity between the several major industry groups in the manufacturing sector, as had been noted in past productivity analyses for many years, and as reviewed in general earlier in this paper. For the span covered by the American Productivity Center multiple-input analysis, primary metals, fabricated metals, and "other manufacturing industries" (a composite of several groups) recorded the weakest patterns of growth in output, total factor, and labor productivity. The machinery except electric group was also weak in its performance except in labor productivity growth for the period 1980-83 (Table 4).

Stronger than average growth rates in output, total factor productivity, and labor productivity were recorded for electrical machinery, chemicals, pulp and paper, and the textiles groups. The other groups recorded essentially mixed, not overly-strong growth patterns in output and the productivities for both 70-80 and 80-83.

B. Levels, U.S.

Every manufacturing industry in the U.S. recorded some growth in labor productivity levels between the initial year 1970 and the terminal year 1983. In the initial year, the lowest levels of 1975 dollar output per hour were for the textiles ($5.12), "other manufacturing" ($6.56), and electrical machinery ($6.90) groups. The other groups' levels ranged from $8.28 to $9.51, except for the two 1970 level leaders, primary metals ($11.51), and chemicals ($10.26).

While no monumental changes were recorded in the 13-year span, new productivity level leaders developed, and earlier leaders fell back in the pack:

Leaders in 1983 output per hour levels:

Chemicals:	$16.41	Food & Tobacco:	$13.72
Pulp/Paper:	13.26	Primary Metals:	13.11
Elec. Machinery:	11.78	Mach., except elec.	11.78

Thus, the divergence between highest and lowest labor productivity levels in manufacturing industry groups was 44.5 percent to 100 percent in 1970, and 53.0 percent to 100 percent in 1983.

In Japan, the picture was entirely different in both divergence in levels (beginning and ending of period) and in trends. The variations appear even more startling to the observer than those between the different sectors of the

business economy.

C. Trends, Japan

Truly unbelievable increases in output, total factor productivity, and in output per hour were registered for the electrical machinery, chemicals, transportation machinery, and machinery except electrical groups (Table 4). Worthy of highlighting here:

	Average annual percents of change in					
	Output		TFP		Labor Productivity	
	70-80	80-83	70-80	80-83	70-80	80-83
Electrical Machinery	18.0	20.9	14.3	12.2	17.0	15.2
Chemicals	9.2	9.2	6.7	9.9	10.3	13.5
Machinery, except elec.	6.6	8.1	6.3	5.6	7.7	7.4
Transportation Equipment	8.4	4.6	5.2	0.7	7.7	3.6

Table 4

UPDATE: Comparative Output and Productivity Patterns,
U.S. and Japan, 1970-83,
for Ten Major Manufacturing Industry Groups

Manufacturing Industry Group	UNITED STATES								JAPAN							
	Avg. Ann. % Change in:						Level of:		Avg. Ann. % Change in:						Level of	
	Output		TFP		Output/Hr.		Output/Hr.[1]		Output		TFP		Output/Hr.		Output/Hr.	
	70-80	80-83	70-80	80-83	70-80	80-83	(U.S. 75$)		70-80	80-83	70-80	80-83	70-80	80-83	(In U.S. 75$)	
							1970	1983							1970	1983
Food & Tobacco	2.5	0.8	2.3	0.3	3.2	1.6	9.51	13.72	5.3	-0.1	2.6	-2.8	5.3	0.1	3.81	7.23
Textiles	2.3	1.2	2.9	4.5	3.7	6.0	5.12	8.74	4.0	2.2	5.3	1.7	7.4	2.9	1.58	3.50
Pulp & Paper	2.9	2.9	1.9	4.3	3.1	5.8	8.28	13.26	3.8	7.9	2.0	5.3	5.8	6.4	5.11	10.79
Chemicals	4.3	3.8	2.5	1.7	3.7	3.5	10.26	16.41	9.2	9.2	6.7	9.9	10.3	13.5	6.54	25.50
Primary Metals	-0.2	-8.5	0.2	-2.9	0.9	1.4	11.51	13.11	7.4	-8.5	4.8	-9.1	9.5	-6.7	8.61	17.37
Fabricated Metals	2.0	-1.3	0.9	1.8	1.7	3.8	8.55	11.37	3.6	2.6	3.1	1.1	4.3	2.3	3.32	5.43
Machinery, ex. Elec.	4.2	2.3	1.2	1.0	1.9	4.6	8.54	11.78	6.6	8.1	6.3	5.6	7.7	7.4	4.03	10.43
Electrical Machinery	5.7	2.4	3.7	1.1	4.6	3.0	6.90	11.78	18.0	20.9	14.3	12.2	17.0	15.2	2.78	20.42
Trans. Equipment	2.3	2.5	1.0	1.8	2.0	3.87	8.47	11.57	8.4	4.6	5.2	0.7	7.7	3.6	5.19	12.17
Other Mfg. Ind.[1]	2.8	1.3	1.1	0.9	2.1	2.3	6.56	8.69	3.9	3.1	1.3	0.7	3.2	2.6	3.83	5.67

[1] Includes apparel, lumber, furniture, printing and publishing, petroleum, rubber, stone, clay and glass, leather, instruments, and miscellaneous manufacturers.

Source: George E. Sadler, for the American Productivity Center

Basic Data: American Productivity Center's U.S./Japan multiple-input data service, with Japanese input by the Japan Productivity Center. (As indicated in footnote 1, table 2, Japanese output values, expressed in constant 1975 yen, were converted to constant 1975 U.S. dollars at the 1975 yen/dollar exchange rate of 272.5 yen per U.S. dollar.)

For the other six composite Japanese industry groups in our analysis, only three had an increase in total factor productivity between 1970-80 of less than 3 percent per year ("other manufacturing composite," pulp and paper, and food/tobacco. The other three ranged from 3.1 percent upward to 5.3 percent).

For total factor productivity during the post-OPEC II period, trends were generally not so good, due to recession and market losses. Declines of over -9 percent per year were suffered by Japan's primary metals and -2.8 percent for food/tobacco manufacturers. Others in the "in between" groups recorded gains, but only in the area of 0.7 percent to 1.7 percent per year, except paper/pulp, which has a strong 5.3 percent per year gain.

Labor productivity trends in 1980-83 for the Japanese industries outside the "growth glamour" groups were more favorable than those for total factor productivity, but not at all spectacular. For the troublesome primary metals group, labor productivity declined a sharp -6.7 percent per year in this period, and food/tobacco industries a -0.1 percent. The other groups -- textiles, pulp/paper, fabricated metals, and other manufacturing -- experienced modest gains, ranging upwards from 0.1 percent per year to a strong 6.4 percent per year, again for the pulp/paper group (which would have ranked with the "growth leader" groups except for its poor total factor productivity growth rate of 2.0 percent per year during 1970-80).

NOTE: Additional useful information on labor productivity trends for manufacturing industry groups for the U.S., France, Germany, and the U.K. is available in a special study report made by the Bureau of Labor Statistics,

presented at the American Enterprise Institute Conference on Inter-industry Differences in Productivity Growth, Washington, DC, October 1984. The results are provided in our Appendix Table 1, in which we have inserted estimates for Japan, hopefully on a relatively comparable basis. Data covers not only 1973-81, but also 1960-73, a useful span for comparative analysis.

D. Labor Productivity Levels, Japan 1970-83

As was the case for the sectors of the Japanese economy, the inter-industry group differences in level were on a scale outside the reference frame for the U.S. or most European economies. The inter-industry divergence was roughly five and one-half to one in 1970 and over seven to one in 1983 (Table 4). The 1970 leaders in Japan (primary metals, $8.61; chemicals, $6.54; and transportation equipment, $5.19) were at that time still far below their U.S. counterparts. By 1983, however, because of differential labor productivity growth rates, the Japanese industry group leaders were far ahead of their U.S. counterparts (as was the electrical machinery group as well).

Labor Productivity Level Leaders: (U.S.$ 1975)

	1970		1983	
Industry	$ Japan	U.S.	$ Japan	U.S.
Primary Metals	8.61	11.51	17.37	13.11
Chemicals	6.54	10.26	25.59	16.41
Trans. Equip.	5.19	8.47	12.17	11.57
Elec. Mach.	2.78	6.90	20.42	11.78

For each of the other six composite industry groups, the level for the U.S. industry was above that for its Japanese counterpart. The margins ranged from slight to significant, as follows:

Industry Group	$ 1983 Level	Percent U.S. Above Japan
Food, Tobacco	13.72	89.8
Textiles	8.74	149.7
Pulp & Paper	13.26	22.9
Fabricated Metals	11.37	109.4
Machinery, except elec.	11.78	12.9
Other Industries	8.69	53.3

As a recap of our analysis of comparative labor productivity levels for U.S. and Japan, the following points appear worthy of re-emphasis:

-- Variations in level <u>within</u> each country:

Japan: a. In 1970, highest to lowest, 545%, (roughly 5-1/2 to 1)
b. In 1983, highest to lowest, 729%, (roughly 7-1/4 to 1)

U.S.: a. In 1970, highest to lowest, 225%, (roughly 2-1/4 to 1)
b. In 1983, highest to lowest, 189%, (roughly 1-3/4 to 1)

-- Variations in level <u>between</u> the countries:

a. In 1970, U.S. highest vs. Japan's lowest: 728.5% -- 7-1/4 to 1.

b. In 1983, Japan's highest vs. U.S. lowest: 293.4% -- 3 to 1

And, finally, the composite level for U.S. manufacturing, in 1975 U.S. dollars and yen equivalents:

	in 1970:	in 1983:	in 1985: (est)
U.S.	$ 7.92	$ 11.17	$ 12.04
Japan	3.91 (49.4%)	9.82 (87.9%)	11.26 (93.5%)

APPENDIX
Table 1

Manufacturing productivity growth, by industry, five countries, 1960-73 and 1973-81
(Average annual percent change)

A. 1960-73

Industry Number	Industry	Japan	United States	France (1967-73)	Germany	United Kingdom	Mean (unweighted excl. Japan)
1	Food & Tobacco	6.7	4.0	6.7	3.1	3.7	4.4
2	Textile, apparel & leather products	4.6	3.7	5.8	5.2	5.2	5.0
3	Lumber, furniture & misc. manufacturers	3.9	3.4	5.8	6.9	4.5	5.2
4	Paper & printing	9.8	2.9	1.8	5.3	3.4	3.4
5	Chemicals & allied products	13.4	5.2	6.6	9.3	7.3	7.1
6	Petroleum & coal products	13.6	4.8	6.6	8.9	8.1	7.1
7	Rubber & miscellaneous plastics products	9.4	2.7	3.4	7.0	4.8	4.5
8	Stone, clay, glass & concrete products	8.2	2.0	7.7	6.4	5.3	5.4
9	Primary metal industries	12.2	2.2	7.5	5.0	2.5	4.3
10	Fabricated metal products	9.7	2.0	4.8	5.8	1.7	3.6
11	Machinery, except electrical & instruments	10.4	2.6	8.3	4.7	4.6	5.1
12	Electrical equipment & supplies	13.0	4.9	7.4	7.2	5.7	6.3
13	Transportation equipment	12.6	4.1	8.4	5.2	2.8	5.1

APPENDIX
Table 1, Page 2

Manufacturing productivity growth by industry, five countries, 1960-73 and 1973-81
(Average annual percent change)

B. 1973-81

Industry Number	Industry	Japan	United States	France (1967-73)	Germany	United Kingdom	Mean (unweighted excl. Japan)
1	Food & Tobacco	2.7	1.0	4.1	2.4	2.7	2.6
2	Textile, apparel & leather products	5.4	3.4	2.7	4.1	2.1	3.1
3	Lumber, furniture & misc. manufacturers	0.4	2.6	4.0	1.1	-0.5	1.8
4	Paper & printing	3.8	0.1	3.6	3.8	0.5	2.0
5	Chemicals & allied products	8.3	1.9	4.3	3.2	1.5	2.7
6	Petroleum & coal products	0.2	-1.8	1.0	2.7	0.3	0.6
7	Rubber & miscellaneous plastics products	10.4	1.0	3.0	3.2	3.0	2.6
8	Stone, clay, glass & concrete products	6.4	0.6	3.9	3.2	1.2	2.2
9	Primary metal industries	5.0	-0.5	3.1	3.4	1.1	1.8
10	Fabricated metal products	0.5	1.4	2.2	3.1	-1.5	1.3
11	Machinery, except electrical & instruments	14.8	2.0	3.8	3.7	1.3	2.7
12	Electrical equipment & supplies	15.4	4.4	5.9	5.3	3.2	4.7
13	Transportation equipment	8.6	-0.6	5.9	3.4	0.7	2.4

Source: U.S. Bureau of Labor Statistics, International Series, except Japan, derived primarily from the American Productivity Center's U.S./Japan bi-laterial multiple-input comparison series.

APPENDIX
Table 2

LEVELS OF OUTPUT PER HOUR, 1970-1983
In Constant US75$ and Yen Equivalents

A. United States

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Private Business	$ 8.33	8.63	8.94	9.18	8.99	9.18	9.42	9.47	9.52	9.39	9.34	9.51	9.51	9.79
Goods Industries:	8.24	8.67	8.94	9.27	8.96	9.18	9.56	9.72	9.68	9.65	9.57	9.89	9.97	10.21
Agriculture, etc.	6.08	6.27	6.13	6.18	6.28	6.67	6.60	6.82	6.57	6.82	7.01	8.00	7.59	6.80
Mining	27.58	27.61	27.67	27.05	25.22	23.16	22.05	21.28	20.94	19.49	18.67	17.43	16.98	18.61
Construction	9.45	9.93	9.74	9.36	9.34	8.51	9.03	8.69	8.33	7.79	7.20	7.17	7.46	7.40
Manufacturing	7.91	8.40	8.83	9.30	9.08	9.35	9.76	10.00	10.10	10.16	10.18	10.50	10.71	11.17
Services Industries:	8.62	8.84	9.18	9.36	9.26	9.39	9.55	9.53	9.63	9.44	9.30	9.48	9.42	9.73
Trasport., Communic.	9.29	9.67	10.14	10.48	10.83	11.33	11.84	12.14	12.53	12.61	12.73	12.87	13.02	13.79
Elec., Gas & Water	21.98	23.69	23.92	24.40	23.32	25.50	25.54	25.90	25.47	25.45	24.79	25.38	24.20	24.64
Trade	6.88	7.11	7.45	7.70	7.55	7.66	7.83	7.96	8.13	8.16	8.08	8.27	8.30	8.77
Finance & Insurance	8.21	8.18	8.23	8.32	8.45	8.49	8.43	8.46	8.31	8.28	8.35	8.29	8.29	8.29
Business Services	7.50	7.52	7.90	7.98	7.74	7.77	7.81	7.32	7.36	6.70	6.78	6.78	6.70	7.03
Manufacturing Industries:														
Food & Tobacco	9.51	10.09	10.77	12.04	11.43	11.86	12.10	12.14	12.13	12.56	13.07	13.08	13.79	13.72
Textiles	5.12	5.35	5.46	5.62	5.34	5.66	6.05	6.90	7.03	7.30	7.35	7.64	8.40	8.74
Paper & Pulp	8.28	9.04	9.84	10.75	10.02	10.25	10.91	11.16	11.30	11.59	11.22	11.38	11.70	13.26
Chemicals	10.26	11.28	12.37	13.19	12.67	13.32	14.35	14.62	14.72	15.33	14.81	15.42	15.18	16.41
Primary Metals	11.51	12.13	12.52	13.47	13.52	11.96	12.09	11.66	12.19	12.42	12.58	12.96	11.84	13.11
Fabricated Metals	8.55	8.66	8.97	9.27	8.60	8.80	9.47	9.80	9.71	10.03	10.15	10.34	10.60	11.37
Mach., Except Elec.	8.54	8.78	9.25	9.34	9.18	9.20	9.86	10.06	10.01	10.11	10.29	11.12	11.41	11.78
Electrical Machinery	6.90	7.44	7.96	8.01	7.54	8.31	8.60	9.27	9.88	10.02	10.79	11.17	11.54	11.78
Transportation Equip.	8.47	9.85	10.28	10.91	10.62	11.07	12.08	12.60	12.37	11.60	10.36	10.37	10.35	11.57
Other Manufacturing	6.56	6.80	7.11	7.47	7.44	7.84	7.90	7.98	8.20	8.04	8.11	8.37	8.54	8.69

1 Includes apparel; lumber; furniture; printing & publishing; petroleum; rubber; stone, clay & glass; leather; instruments; and miscellaneous manufacturers.

APPENDIX
Table 2, Page 2

LEVELS OF OUTPUT PER HOUR, 1970-1983
In Constant US75$ and Yen Equivalents

B. Japan

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Private Business	$ 3.59	3.82	4.29	4.64	4.73	4.89	5.01	5.18	5.39	5.69	6.07	6.26	6.42	6.64
Goods Industries:	3.14	3.36	3.80	4.22	4.29	4.49	4.70	4.95	5.25	5.64	6.07	6.36	6.70	7.03
Agriculture, etc.	1.37	1.42	1.76	2.05	2.11	2.18	2.10	2.10	2.13	2.29	2.38	2.30	2.35	2.48
Mining	5.07	5.54	6.75	7.96	7.10	7.52	9.41	9.99	11.64	10.10	10.73	11.19	9.51	12.83
Construction	3.85	3.89	4.12	4.25	4.06	4.44	4.10	4.14	4.27	4.29	4.08	4.24	4.17	3.92
Manufacturing	3.91	4.18	4.66	5.12	5.31	5.54	6.04	6.46	6.94	7.50	8.20	8.68	9.31	9.82
Services Industries:	4.20	4.43	4.91	5.16	5.26	5.35	5.35	5.43	5.55	5.74	6.08	6.15	6.14	6.26
Trasport., Communic.	3.86	3.98	4.07	4.29	4.79	4.76	4.84	4.86	4.79	4.90	5.58	5.82	5.43	5.64
Elec., Gas & Water	14.01	15.61	16.16	14.09	15.05	16.32	16.69	15.55	16.58	18.31	17.60	17.52	19.87	21.40
Trade	2.88	3.10	3.60	3.90	3.98	3.99	4.06	4.08	4.25	4.48	4.73	4.79	4.75	4.81
Finance & Insurance	6.69	7.46	9.68	10.32	9.09	10.18	9.86	10.98	12.27	11.88	11.98	12.38	12.97	14.72
Business Services	3.39	3.38	3.58	3.60	3.69	3.53	3.41	3.40	3.32	3.44	3.63	3.53	3.61	3.49
Manufacturing Industries:														
Food & Tobacco	3.81	4.26	4.35	5.61	6.03	6.39	6.08	6.78	5.80	6.23	7.20	6.78	6.99	7.23
Textiles	1.57	1.62	1.73	1.82	2.47	2.54	2.59	2.78	2.58	2.76	3.21	3.31	3.63	3.50
Paper & Pulp	5.11	5.54	6.78	7.13	6.83	7.55	8.47	8.16	9.03	9.90	8.96	10.17	10.32	10.79
Chemicals	6.54	8.44	10.21	10.48	10.63	10.56	11.53	14.68	19.00	18.82	17.45	19.52	22.37	25.50
Primary Metals	8.61	9.94	11.66	13.20	12.12	13.74	16.11	16.07	17.79	21.52	21.37	19.36	20.07	17.37
Fabricated Metals	3.32	3.52	4.02	4.85	4.16	3.73	3.88	4.32	4.95	5.14	5.07	5.34	5.58	5.43
Mach., Except Elec.	4.03	4.27	4.37	4.59	4.78	5.26	5.95	6.14	7.09	7.60	8.42	9.53	10.14	10.43
Electrical Machinery	2.78	3.18	4.14	5.03	5.68	5.41	6.87	7.80	9.11	10.97	13.36	14.82	17.13	20.42
Transportation Equip.	5.19	5.05	5.18	5.89	6.82	7.02	7.84	8.18	8.60	9.37	10.95	11.56	12.03	12.17
Other Manufacturing	3.83	3.87	4.23	4.26	4.16	4.42	4.66	4.80	5.09	4.98	5.25	5.54	5.72	5.67

1 As for the U.S., above, includes apparel; lumber; furniture; printing & publishing; petroleum; rubber; stone, clay & glass; leather; instruments; and miscellaneous manufactures.

Source: George E. Sadler, for the APC.

Basic Data: APC's Japan/U.S. multiple-input data service, with Japan figures by the Japan Productivity Center.

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

1. Private Business

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	79.61	90.57	78.54	86.06	92.50	87.9	101.4	86.7
1971	82.31	90.33	81.22	86.92	94.71	91.1	101.3	89.9
1972	87.80	93.01	84.23	89.72	97.86	94.4	104.2	90.6
1973	93.67	96.68	87.86	93.37	100.32	96.9	106.6	90.9
1974	92.17	97.09	91.14	94.86	97.17	94.9	101.1	93.9
1975	90.24	93.15	93.72	93.37	96.65	96.9	96.3	100.6
1976	95.47	96.02	96.58	96.23	99.21	99.4	98.8	100.6
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	105.48	105.02	103.88	104.59	100.85	100.4	101.5	98.9
1979	107.87	108.79	108.09	108.53	99.39	99.1	99.8	99.4
1980	106.47	108.01	111.84	109.45	97.28	98.6	95.2	103.5
1981	109.22	108.75	115.57	111.31	98.12	100.4	94.5	106.3
1982	106.39	106.02	118.59	110.73	96.07	100.3	89.7	111.9
1983	111.06	107.46	121.49	112.72	98.53	103.3	91.4	113.1
				JAPAN				
1970	70.03	101.05	53.13	81.12	86.33	69.3	131.80	52.6
1971	74.43	100.81	60.08	83.86	88.75	73.8	123.89	59.6
1972	83.01	100.23	67.76	86.72	95.72	82.8	122.52	67.6
1973	90.95	101.56	75.01	90.52	100.47	89.5	121.24	73.9
1974	89.10	97.60	81.67	90.98	97.93	91.3	109.09	83.7
1975	90.27	95.62	87.88	92.40	97.70	94.4	102.72	91.9
1976	95.40	98.68	93.77	96.64	98.72	96.7	101.74	95.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	105.65	101.45	105.79	103.26	102.32	104.1	99.87	104.3
1979	112.86	102.65	112.80	106.87	105.60	109.9	100.06	109.9
1980	121.24	103.38	120.27	110.41	109.81	117.3	100.81	116.3
1981	125.59	103.98	128.38	114.13	110.05	120.8	97.83	123.5
1982	130.21	105.04	136.01	117.93	110.42	124.0	95.73	129.5
1983	136.67	106.61	144.37	122.32	111.73	128.2	94.66	135.4

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

2. Goods Producing Industry

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	81.64	96.27	81.08	90.88	89.84	84.8	100.7	84.2
1971	84.14	94.37	82.62	90.20	93.29	89.2	101.8	87.6
1972	90.17	97.97	84.45	93.17	96.77	92.0	106.8	86.2
1973	97.63	102.38	86.85	96.86	100.79	95.4	112.4	84.8
1974	93.22	101.14	90.05	97.20	95.90	92.2	103.5	89.0
1975	87.40	92.50	92.82	92.61	94.38	94.5	94.2	100.4
1976	94.34	95.86	96.04	95.93	98.35	98.4	98.2	100.2
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	105.00	105.42	104.34	105.04	99.96	99.6	100.6	99.0
1979	107.62	108.43	109.33	108.75	98.97	99.3	98.4	100.8
1980	102.95	104.56	113.56	107.75	95.54	98.5	90.7	108.6
1981	105.99	104.18	117.68	108.98	97.26	101.7	90.1	113.0
1982	100.15	97.64	120.12	105.62	94.82	102.6	83.4	123.0
1983	103.07	98.11	121.55	106.43	96.84	105.1	84.8	123.9
				JAPAN				
1970	70.89	111.90	53.68	88.32	80.26	63.4	132.05	48.0
1971	74.36	109.62	61.16	89.99	83.63	67.	121.58	55.8
1972	82.50	107.54	69.01	91.94	89.74	76.7	119.55	64.2
1973	92.41	108.45	76.22	95.39	96.87	85.2	121.24	70.3
1974	89.28	103.10	82.63	94.81	94.17	86.6	108.05	80.1
1975	88.38	97.57	88.48	93.89	94.14	90.6	99.89	90.7
1976	95.00	100.06	94.20	97.69	97.25	94.9	100.85	94.1
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	106.98	100.99	105.06	102.64	104.23	105.9	101.83	104.0
1979	114.90	100.78	111.13	104.97	109.46	114.0	103.40	110.3
1980	122.88	100.27	117.81	107.37	114.44	122.5	104.31	117.5
1981	128.93	100.31	125.28	110.42	116.76	128.5	102.91	124.9
1982	135.38	100.06	132.08	113.03	119.78	135.3	102.50	132.0
1983	142.56	100.41	139.05	116.06	122.83	142.0	102.53	138.5

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

3. Services Industries

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	78.15	86.39	77.53	82.83	94.35	90.5	100.8	89.8
1971	81.00	87.36	80.67	84.67	95.67	92.7	100.4	92.3
1972	86.10	89.36	84.15	87.27	98.66	96.3	102.3	94.2
1973	90.83	92.48	88.27	90.79	100.05	98.2	102.9	95.4
1974	91.43	94.11	91.57	93.09	98.21	97.1	99.8	97.3
1975	92.26	93.64	94.08	93.81	98.35	98.5	98.1	100.5
1976	96.27	96.14	96.80	96.40	99.87	100.1	99.5	100.7
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	105.83	104.72	103.70	104.31	101.45	101.1	102.1	99.0
1979	108.04	109.06	107.61	108.48	99.60	99.1	100.4	98.7
1980	108.98	110.54	111.16	110.79	98.37	98.6	98.0	100.6
1981	111.53	112.11	114.73	113.16	98.56	99.5	97.2	102.3
1982	110.86	112.18	117.99	114.52	96.80	98.8	94.0	105.2
1983	116.78	114.34	121.47	117.21	99.64	102.1	96.1	106.2
				JAPAN				
1970	69.18	89.28	52.14	74.08	93.38	77.5	132.67	58.4
1971	74.50	91.26	58.13	78.41	95.02	81.6	128.18	63.7
1972	83.52	92.30	65.49	82.36	101.41	90.5	127.52	71.0
1973	89.49	94.09	72.83	86.46	103.51	95.1	122.88	77.4
1974	88.91	91.64	79.95	87.80	101.27	97.0	111.22	87.2
1975	92.15	93.51	86.80	91.36	100.86	98.5	106.16	92.8
1976	95.80	97.18	92.98	95.91	99.89	98.6	103.03	95.7
1976	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	104.34	101.96	107.09	103.28	101.02	102.3	97.43	105.0
1979	110.85	104.68	115.82	107.43	103.18	105.9	95.71	110.6
1980	119.61	106.75	124.70	111.47	107.30	112.0	95.92	116.8
1981	122.29	107.95	133.97	115.35	106.02	113.3	91.29	124.1
1982	125.09	110.45	143.11	119.68	104.52	113.3	87.41	129.6
1983	130.83	113.33	153.97	124.31	105.24	115.4	84.97	135.9

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

4. Agriculture, Forestry & Fisheries

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	93.00	104.18	78.24	83.22	111.75	89.3	118.9	75.1
1971	97.27	105.77	80.27	85.16	114.22	92.0	121.2	75.9
1972	95.90	106.69	82.14	86.85	110.42	89.9	116.8	77.0
1973	95.52	105.29	85.34	89.17	107.12	90.7	111.9	81.0
1974	96.99	105.34	88.69	91.89	105.55	92.1	109.4	84.2
1975	100.30	102.52	92.28	94.24	106.42	97.8	108.7	90.0
1976	96.97	100.09	96.10	96.87	100.11	96.9	100.9	96.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	100.23	103.96	104.60	104.48	95.93	96.4	95.8	100.6
1979	105.26	105.13	108.74	108.04	97.42	100.1	96.8	103.4
1980	105.74	102.80	111.15	109.55	96.52	102.9	95.1	108.1
1981	122.54	104.46	112.76	111.17	110.24	117.3	108.7	107.9
1982	119.46	107.22	112.71	111.66	106.98	111.4	106.0	105.1
1983	105.92	106.12	112.25	111.07	95.37	99.8	94.4	105.8
				JAPAN				
1970	95.13	145.60	52.79	69.13	137.61	65.3	180.19	36.3
1971	90.42	133.11	59.05	72.08	125.44	67.9	153.13	44.4
1972	103.13	122.74	66.52	76.41	134.96	84.0	155.04	54.2
1973	110.64	113.18	73.17	80.22	137.93	97.8	151.20	64.7
1974	108.73	107.86	79.02	84.09	129.29	100.8	137.60	64.7
1975	107.59	103.45	85.11	88.33	121.80	104.0	125.42	82.3
1976	102.12	101.81	93.25	94.76	107.77	100.3	109.51	91.6
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	100.87	99.30	108.21	106.64	94.59	101.6	93.22	109.0
1979	101.57	93.09	116.49	112.38	90.38	109.1	87.19	125.1
1980	97.24	85.72	124.63	117.78	82.56	113.4	78.02	145.4
1981	95.56	86.92	132.25	124.28	76.89	109.9	72.25	152.2
1982	97.53	86.92	138.68	129.57	75.27	112.2	70.33	159.6
1983	99.29	83.89	145.50	134.66	73.74	118.4	68.24	173.4

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

5. Mining

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	96.98	74.84	84.97	79.52	121.95	129.6	114.1	113.5
1971	94.43	72.80	85.40	78.62	120.12	129.7	110.6	117.3
1972	97.39	74.92	85.74	79.92	121.87	130.0	113.6	114.4
1973	98.30	77.36	86.77	81.71	120.31	127.1	113.3	112.2
1974	98.59	83.20	88.14	85.48	115.33	118.5	111.8	105.9
1975	96.66	88.85	91.07	89.87	107.55	108.8	106.1	102.5
1976	97.89	94.48	95.02	94.73	103.34	103.6	103.0	100.6
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	102.96	104.66	104.72	104.69	98.35	98.4	98.3	100.1
1979	106.77	116.58	109.10	113.13	94.38	91.6	97.9	93.6
1980	110.57	126.07	113.74	120.37	91.85	87.7	97.2	90.2
1981	115.38	140.89	119.54	131.03	88.06	81.9	96.5	84.9
1982	110.73	138.82	123.37	131.68	84.09	79.8	89.8	88.9
1983	107.62	123.09	124.57	123.78	86.95	87.4	86.4	101.2
				JAPAN				
1970	81.66	160.98	82.15	120.22	67.92	50.7	99.40	51.0
1971	85.61	154.47	88.05	120.13	71.26	55.4	97.23	57.0
1972	88.98	131.71	90.54	110.42	80.58	67.6	98.27	68.7
1973	95.69	120.05	89.69	104.35	91.70	79.7	106.69	74.7
1974	81.26	114.36	91.89	102.75	79.09	71.1	88.43	80.4
1975	77.30	102.71	97.08	99.80	77.45	75.3	79.62	94.5
1976	90.93	96.48	99.57	98.08	92.71	94.2	91.32	103.2
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	101.67	87.26	101.78	94.77	107.29	116.5	99.90	116.6
1979	97.57	88.62	103.13	96.12	101.51	110.1	94.61	116.4
1980	102.61	95.52	105.67	100.77	101.83	107.4	97.10	110.6
1981	103.84	92.70	106.09	99.62	104.24	112.0	97.88	114.4
1982	103.17	108.40	106.69	107.51	95.96	95.2	96.70	98.4
1983	104.46	81.30	106.69	94.42	110.63	128.5	97.92	131.2

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

6. Construction

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	97.21	89.42	85.50	88.43	109.92	108.7	113.7	95.6
1971	105.39	92.24	88.55	91.31	115.42	114.3	119.0	96.0
1972	108.00	96.32	93.13	95.52	113.07	112.1	116.0	96.7
1973	109.41	101.60	95.80	100.14	109.26	107.7	114.2	94.3
1974	95.98	101.00	98.09	100.27	96.72	96.0	98.9	97.1
1975	87.89	89.77	97.71	91.77	95.77	97.9	90.0	108.8
1976	96.03	92.44	97.71	93.77	102.41	103.9	98.3	105.7
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	106.91	111.56	103.48	109.52	97.62	95.8	103.3	92.8
1979	105.97	118.20	106.32	115.21	91.98	89.6	99.7	90.0
1980	95.04	114.65	106.62	112.63	84.38	82.9	85.6	96.3
1981	91.15	110.55	106.45	109.52	83.23	82.4	85.6	96.3
1982	88.96	103.60	104.58	103.85	85.67	85.9	85.1	100.9
1983	91.33	107.22	103.05	106.17	86.02	85.2	88.6	96.1
				JAPAN				
1970	78.46	84.36	39.51	71.18	110.24	93.0	198.60	46.8
1971	84.14	89.61	47.97	77.37	108.75	93.9	175.39	53.5
1972	93.09	93.60	58.05	83.15	111.96	99.5	160.37	62.0
1973	101.73	99.02	69.39	90.31	112.64	102.7	146.60	70.1
1975	102.58	95.54	84.28	92.23	111.22	107.4	121.71	88.2
1976	98.44	99.32	90.41	96.70	101.79	99.1	108.88	91.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	109.29	105.88	103.81	105.27	103.82	103.2	105.28	98.0
1979	111.41	107.41	113.20	109.11	102.10	103.7	98.42	105.4
1980	107.94	109.41	122.22	113.18	95.37	98.7	88.32	111.7
1981	109.96	107.43	132.06	114.67	95.89	102.4	83.27	122.9
1982	107.38	106.62	140.38	116.55	92.13	100.7	76.49	131.7
1983	100.95	106.62	151.02	119.67	84.35	94.7	66.85	141.6

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

7. All Manufacturing

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	77.00	97.26	80.63	92.54	83.21	79.2	95.5	82.9
1971	78.68	93.69	82.23	90.43	87.00	84.0	95.7	87.8
1972	86.24	97.75	84.27	93.92	91.82	88.2	102.3	86.2
1973	95.91	103.13	86.78	98.49	97.38	93.0	110.5	84.1
1974	91.89	101.19	90.46	98.14	93.63	90.8	101.6	89.4
1975	85.39	91.39	93.15	91.89	92.92	93.4	91.7	101.9
1976	93.58	95.89	96.18	95.97	97.51	97.6	97.3	100.3
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	105.32	104.39	104.21	104.34	100.94	100.9	100.1	99.8
1979	108.20	106.54	109.73	107.45	100.70	101.6	98.6	103.0
1980	103.49	101.72	114.60	105.37	98.21	101.7	90.3	112.7
1981	106.06	101.09	119.25	106.25	99.82	104.9	88.9	118.0
1982	99.25	92.70	122.29	101.11	98.16	107.1	81.2	131.9
1983	104.41	93.52	124.49	102.31	102.05	111.6	83.9	133.1
				JAPAN				
1970	65.32	107.87	54.94	88.44	73.85	60.6	118.89	50.9
1971	69.36	107.01	62.79	90.78	76.40	64.8	110.45	58.7
1972	76.74	106.32	70.65	93.23	82.31	72.2	108.62	66.4
1973	87.37	110.07	77.78	98.22	88.95	79.4	112.32	70.7
1974	85.66	104.16	84.33	96.88	88.41	82.2	101.57	81.0
1975	82.21	95.78	89.98	93.65	87.78	85.8	91.36	93.9
1976	93.19	99.65	94.83	97.88	95.21	93.5	98.27	95.2
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	107.34	99.90	104.07	101.43	105.83	107.5	103.14	104.2
1979	118.00	101.57	109.08	104.33	113.11	116.2	108.18	107.4
1980	130.73	102.93	115.07	107.38	121.75	127.0	113.62	111.8
1981	139.00	103.31	122.36	110.30	126.02	134.5	113.60	118.4
1982	148.57	102.98	129.24	112.62	131.92	144.3	114.95	125.5
1983	160.15	105.27	136.02	116.56	137.40	152.1	117.74	129.2

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

8. Transportation & Communications

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	74.06	96.81	81.14	91.59	80.86	76.5	91.3	83.8
1971	75.32	94.52	83.61	90.89	82.87	79.7	90.1	88.5
1972	81.25	97.29	85.41	93.33	87.06	83.5	95.1	87.8
1973	86.58	100.34	89.11	96.60	89.63	86.3	97.2	88.8
1974	89.17	99.98	92.54	97.50	91.46	89.2	96.4	92.6
1975	88.78	95.09	95.08	95.09	93.36	93.4	93.4	100.0
1976	94.11	96.46	97.37	96.76	97.27	97.6	96.7	100.9
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	108.50	105.12	103.21	104.49	103.84	103.2	105.1	98.2
1979	113.46	109.21	106.75	108.39	104.67	103.9	106.3	97.7
1980	112.98	107.71	109.89	108.44	104.19	104.9	102.8	102.0
1981	114.43	107.94	112.63	109.50	104.50	106.0	101.6	104.3
1982	111.05	103.55	114.69	107.26	103.53	107.2	96.8	110.8
1983	114.39	100.71	115.94	105.78	108.13	113.6	98.7	115.1
				JAPAN				
1970	74.40	93.46	59.77	89.01	83.58	79.6	124.48	63.9
1971	78.07	95.15	66.72	91.39	85.43	82.1	117.01	70.1
1972	79.71	95.03	75.22	92.41	86.26	83.9	105.97	79.2
1973	88.11	99.67	82.22	97.36	90.50	88.4	107.17	82.5
1974	94.06	96.40	88.92	95.41	98.58	97.6	105.79	92.2
1975	94.41	96.24	92.89	95.80	98.55	98.1	101.64	96.5
1976	100.21	100.57	95.65	99.92	100.28	99.6	104.77	95.1
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	99.24	100.51	103.64	100.92	98.33	98.7	95.75	103.1
1979	104.69	103.73	110.97	104.68	100.00	100.9	94.34	107.0
1980	119.02	103.65	117.31	105.45	112.86	114.8	101.46	113.2
1981	121.81	101.64	121.26	104.23	116.87	119.8	100.45	119.3
1982	116.56	104.31	125.26	107.07	108.86	111.7	93.05	120.1
1983	121.06	104.31	132.55	108.03	112.06	116.1	91.34	127.1

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

9. Electricity, Gas & Water Public Utilities

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	80.87	95.27	68.85	78.49	103.03	84.9	117.5	72.3
1971	86.57	94.63	73.50	81.21	106.60	91.5	117.8	77.7
1972	89.28	96.66	78.59	85.18	104.81	92.4	113.6	81.3
1973	93.60	99.32	83.87	89.51	104.57	94.2	111.6	84.4
1974	90.13	100.09	88.80	92.92	97.00	90.0	101.5	88.7
1975	96.23	97.71	92.15	94.18	102.17	98.5	104.4	94.3
1976	96.67	98.02	95.70	96.55	100.13	98.6	101.0	97.6
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	103.75	105.48	104.51	104.86	98.94	98.4	99.3	99.1
1979	107.50	109.38	109.18	109.26	98.39	98.3	98.5	99.8
1980	107.51	112.31	113.39	113.00	95.15	95.7	94.8	101.0
1981	113.41	115.69	117.82	117.05	96.90	98.0	96.3	101.8
1982	110.01	117.74	122.32	120.65	91.18	93.4	89.9	103.9
1983	112.48	118.20	126.54	123.49	91.09	95.2	88.9	107.1
				JAPAN				
1970	80.62	89.44	56.54	72.17	111.72	90.1	142.59	63.2
1971	90.39	90.04	61.40	75.01	120.51	100.4	147.21	68.2
1972	92.35	88.86	68.09	77.95	118.47	103.9	135.63	76.6
1973	91.97	101.45	74.63	87.37	105.27	90.7	123.24	73.6
1974	92.61	95.66	81.04	87.98	105.26	96.8	114.28	84.7
1975	102.54	97.68	86.56	91.84	111.65	105.0	118.46	88.6
1976	106.30	98.99	92.95	95.82	110.94	107.4	114.36	93.9
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	107.25	100.58	108.55	104.76	102.37	106.6	98.0	107.9
1979	117.47	99.73	118.12	109.38	107.39	117.8	99.45	118.4
1980	117.77	104.00	125.60	115.34	102.10	113.2	93.76	120.8
1981	119.08	105.70	133.93	120.52	98.80	112.7	88.91	126.7
1982	129.46	101.30	141.25	122.27	105.88	127.8	91.65	139.4
1983	139.41	101.30	148.29	125.97	110.67	137.6	94.02	146.4

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

10. Trade

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	76.37	88.35	74.88	85.09	89.75	86.4	102.0	84.8
1971	80.28	89.85	78.04	86.99	92.28	89.4	102.9	86.9
1972	86.35	92.18	82.04	89.73	96.23	93.7	105.3	89.0
1973	91.40	94.49	86.69	92.60	98.70	96.7	105.4	91.8
1974	89.60	94.38	90.51	93.45	95.89	94.9	99.0	95.9
1975	90.75	94.32	93.08	94.02	96.52	96.2	97.5	98.7
1976	95.30	96.82	96.12	96.65	98.60	98.4	99.1	99.3
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	105.88	103.60	104.71	103.87	101.94	102.2	101.1	101.1
1979	108.50	105.75	110.02	106.78	101.61	102.6	98.6	104.0
1980	106.47	104.88	114.14	107.12	99.39	101.5	93.3	108.8
1981	109.38	105.30	118.32	108.45	100.86	103.9	92.4	112.4
1982	108.35	103.82	122.08	108.24	100.10	104.4	88.8	117.6
1983	115.44	104.70	126.91	110.08	104.88	110.3	91.0	121.2
				JAPAN				
1970	66.35	94.19	49.11	79.77	83.17	70.4	135.09	52.1
1971	71.59	94.28	54.45	81.53	87.80	75.9	131.48	57.7
1972	82.60	93.68	61.08	83.25	99.21	88.2	135.22	65.2
1973	89.98	94.27	68.89	86.15	104.45	95.5	130.62	73.1
1974	88.97	91.24	77.01	86.68	102.64	97.5	115.53	84.4
1975	91.39	93.47	85.10	90.79	100.66	97.8	107.39	91.1
1976	96.04	96.61	92.65	95.34	100.73	99.4	103.66	95.9
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	104.62	100.56	106.55	102.48	102.09	104.0	98.19	106.0
1979	110.96	101.20	114.37	105.42	105.26	109.6	97.02	113.0
1980	121.11	104.59	122.95	110.46	109.64	115.8	98.50	117.6
1981	122.91	104.78	131.27	113.26	108.53	117.3	93.63	125.3
1982	123.61	106.35	138.11	116.52	106.09	116.2	89.50	129.9
1983	126.30	107.28	145.22	119.42	105.76	117.7	86.97	135.4

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

11. Finance and Insurance

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	80.25	82.67	52.92	79.72	100.67	97.1	151.7	64.0
1971	81.81	84.58	57.11	81.86	99.94	96.7	143.3	67.5
1972	84.76	87.09	64.21	84.83	99.92	97.3	132.0	73.7
1973	89.10	90.59	71.83	88.73	100.41	98.4	124.0	79.3
1974	92.97	93.03	78.68	91.61	101.49	99.9	118.2	84.6
1975	95.02	94.64	84.52	93.64	101.47	100.4	112.4	89.3
1976	96.08	96.41	91.50	95.92	100.16	99.7	105.0	94.9
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	105.07	106.97	110.49	107.32	97.90	98.2	95.1	103.3
1979	109.42	111.78	122.63	112.85	96.96	97.9	89.2	109.7
1980	112.84	114.31	135.79	116.43	96.91	98.7	83.1	118.8
1981	116.09	118.39	151.78	121.70	95.39	98.1	76.5	128.2
1982	118.22	120.58	168.78	125.35	94.31	98.0	70.0	140.0
1983	120.17	122.61	188.71	129.15	93.04	98.0	63.7	153.9
				JAPAN				
1970	52.79	86.61	61.59	76.52	68.99	61.0	85.72	71.1
1971	62.90	92.50	66.13	81.88	76.82	68.0	95.11	71.1
1972	81.86	92.79	70.59	83.84	97.63	88.2	115.96	76.1
1973	84.93	90.34	73.34	83.49	101.72	94.0	115.80	81.2
1974	73.55	89.43	77.24	84.52	87.03	82.2	95.23	86.4
1975	86.66	93.41	86.19	90.50	95.76	92.8	100.55	92.3
1976	87.95	97.87	92.96	95.89	91.72	89.9	94.61	95.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	111.52	99.75	106.03	102.28	109.03	111.8	105.17	106.3
1979	111.44	103.02	108.74	105.33	105.81	108.2	102.48	105.6
1980	115.30	105.67	114.76	109.33	105.46	109.1	100.47	108.6
1981	122.47	108.56	120.46	113.36	108.04	112.8	101.67	111.0
1982	129.73	109.79	126.25	116.42	111.43	118.2	102.76	115.0
1983	147.21	109.79	129.97	117.92	124.84	134.1	113.27	118.4

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

12. Real Estate

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	75.61	79.12	85.60	85.20	88.74	95.6	88.3	108.2
1971	80.74	84.08	88.26	88.00	91.74	96.0	91.5	105.0
1972	83.69	87.25	91.22	90.98	91.98	95.9	91.7	104.6
1973	85.24	91.36	94.56	94.37	90.33	93.3	90.1	103.5
1974	87.41	92.46	96.07	95.85	91.20	94.5	91.0	103.9
1975	86.17	91.34	97.08	96.73	89.08	94.3	88.8	106.3
1976	90.67	93.64	98.31	98.02	92.50	96.8	92.2	105.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	104.38	110.89	101.88	102.43	101.91	94.1	102.5	91.9
1979	110.80	119.62	103.83	104.79	105.73	92.6	106.7	86.8
1980	110.08	121.43	105.28	106.26	103.59	90.7	104.6	86.7
1981	109.92	119.93	106.47	107.29	102.45	91.7	103.2	88.8
1982	108.22	120.04	107.32	108.10	100.11	90.1	100.8	89.4
1983	107.91	129.30	109.51	110.72	97.46	83.5	98.5	84.7
				JAPAN				
1970	61.96	64.56	47.08	48.02	129.02	96.0	131.60	72.9
1971	67.25	73.37	56.23	57.15	117.67	91.7	119.61	76.6
1972	72.44	73.37	66.09	66.48	108.97	98.7	109.62	90.1
1973	82.05	85.34	75.84	76.35	107.46	96.1	108.19	88.9
1974	86.40	89.46	81.92	82.33	104.94	96.6	105.46	91.6
1975	88.35	87.45	89.23	89.13	99.12	101.0	99.02	102.0
1976	94.02	89.08	94.26	93.98	100.04	105.5	99.74	105.8
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	104.95	106.23	103.53	103.68	101.22	98.8	101.37	97.5
1979	113.43	108.74	108.79	108.78	104.27	104.3	104.27	100.0
1980	123.06	116.45	115.79	115.83	106.24	105.7	106.27	99.4
1981	127.95	128.79	123.11	123.41	103.67	99.3	103.93	95.6
1982	130.65	134.10	132.25	132.35	98.72	97.4	98.79	98.6
1983	137.59	143.68	143.59	143.59	95.82	95.8	95.82	99.9

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

13. Business Services

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	83.06	81.10	77.60	80.17	103.60	102.4	107.0	95.7
1971	84.20	81.98	80.63	81.62	103.16	102.7	104.4	98.4
1972	89.51	83.02	84.04	83.29	107.46	107.8	106.5	101.2
1973	94.98	87.16	87.82	87.34	108.75	109.0	108.2	100.7
1974	96.96	91.80	91.04	91.60	105.85	105.6	106.5	99.2
1975	97.40	91.82	93.76	92.34	105.48	106.1	103.9	102.1
1976	101.41	95.06	96.78	95.52	106.17	106.7	104.8	101.8
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	105.46	105.03	103.73	104.68	100.74	100.4	101.7	98.8
1979	102.49	112.12	107.40	110.86	92.45	91.4	95.4	95.8
1980	108.79	117.52	110.98	115.78	93.97	92.6	98.0	94.4
1981	111.61	120.59	114.49	118.96	93.82	92.5	97.5	94.9
1982	113.12	123.67	117.60	122.05	92.68	91.5	96.2	95.1
1983	123.67	128.92	120.30	126.62	97.68	95.9	102.8	93.3
				JAPAN				
1970	83.36	83.63	40.65	66.83	124.74	99.7	205.05	48.6
1971	86.34	86.94	47.60	71.56	120.65	99.3	181.37	54.8
1972	95.59	90.68	56.08	77.15	123.90	105.4	170.45	61.8
1973	97.90	92.47	65.04	81.74	119.76	105.9	150.51	70.3
1974	95.92	90.53	73.64	83.93	114.29	106.0	130.26	81.3
1975	96.31	92.66	82.56	88.71	108.57	103.9	116.66	89.1
1976	96.96	96.74	90.19	94.18	102.96	100.2	107.51	93.2
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	101.87	104.40	111.45	107.16	95.06	97.6	91.40	106.8
1979	110.68	109.43	125.64	115.77	95.60	101.1	88.09	114.8
1980	117.75	110.33	141.65	122.57	96.07	106.7	83.13	128.4
1981	117.50	113.08	161.77	132.12	88.94	103.9	72.63	143.1
1982	124.24	116.92	184.26	143.25	86.73	106.3	67.43	157.6
1983	126.67	123.51	213.28	158.61	79.86	102.6	59.39	172.7

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

14. Manufacturing -- Food and Tobacco Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	83.77	106.94	88.56	101.20	82.78	78.3	94.6	82.8
1971	86.86	104.48	89.65	99.85	86.99	83.1	96.9	85.8
1972	91.66	103.36	90.74	99.42	92.19	88.7	101.0	87.8
1973	101.01	101.84	91.83	98.72	102.32	99.2	110.0	90.2
1974	95.52	101.42	94.01	99.11	96.38	94.2	101.6	92.7
1975	96.23	98.49	95.37	97.51	98.68	97.7	100.9	96.8
1976	100.15	100.50	97.55	99.58	100.57	99.6	102.7	97.1
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	100.08	100.13	102.72	100.94	99.14	99.9	97.4	102.6
1979	104.73	101.22	106.27	102.79	101.88	103.5	98.6	105.0
1980	106.96	99.37	109.26	102.46	104.39	107.6	97.9	110.0
1981	104.97	97.47	111.99	102.00	102.92	107.7	93.7	114.9
1982	106.95	94.19	113.08	100.08	106.86	113.6	94.6	120.1
1983	104.41	92.37	112.53	98.66	105.82	113.0	92.8	121.8
				JAPAN				
1970	62.39	111.18	83.95	74.32	56.1	113.84	49.3	
1971	65.21	103.74	62.28	83.72	77.89	62.9	104.69	60.0
1972	64.56	100.71	71.17	86.44	74.69	64.1	90.71	70.7
1973	84.58	102.22	78.80	90.91	93.04	82.7	107.34	77.1
1974	87.15	98.01	84.87	91.66	95.08	88.9	102.69	86.6
1975	88.78	94.24	89.92	92.15	96.34	94.2	98.73	95.4
1976	89.81	100.13	94.88	97.60	92.02	89.7	94.66	94.8
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	85.10	99.55	105.24	102.30	83.19	85.5	80.86	105.7
1979	97.42	99.70	112.77	106.02	91.89	97.7	86.39	113.1
1980	104.31	98.19	119.16	108.32	96.30	106.2	87.54	121.4
1981	100.29	100.38	125.37	112.45	89.19	99.9	80.00	124.9
1982	100.74	97.68	130.90	113.72	88.58	103.1	76.96	134.0
1983	104.17	97.68	139.53	117.89	88.36	106.6	74.66	142.8

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

15. Manufacturing -- Textiles Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	78.70	105.90	89.40	101.50	77.54	74.3	88.0	84.4
1971	81.95	105.70	91.39	101.88	80.44	77.5	89.7	86.5
1972	87.86	110.96	94.04	106.44	82.54	79.2	93.4	84.7
1973	91.41	112.25	96.69	108.10	84.56	81.4	94.5	86.1
1974	80.35	103.76	98.68	102.40	78.47	77.4	81.4	95.1
1975	76.52	93.16	98.68	94.63	80.86	82.1	77.5	105.9
1976	87.89	100.22	99.34	99.99	87.90	87.7	88.5	99.1
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	101.20	99.32	101.32	99.85	101.35	101.9	99.9	102.0
1979	102.85	97.12	102.17	98.47	104.45	105.9	100.7	105.2
1980	98.67	92.61	102.78	95.32	103.51	106.5	96.0	111.0
1981	98.07	88.54	103.31	92.49	106.04	110.8	94.9	116.7
1982	93.23	76.55	102.65	83.52	111.63	121.8	90.8	134.1
1983	102.37	80.80	102.65	86.64	118.16	126.7	99.7	127.0
				JAPAN				
1970	75.54	133.44	71.50	112.32	67.26	56.6	105.65	53.6
1971	76.14	131.08	79.28	113.42	67.14	58.1	96.05	60.5
1972	75.64	121.93	86.24	109.76	68.91	62.0	87.71	70.7
1973	79.45	121.84	92.70	111.90	71.00	65.2	85.70	76.1
1974	96.18	108.33	96.34	104.24	92.26	88.8	99.83	88.9
1975	89.53	98.13	98.39	98.22	91.16	91.2	91.00	100.3
1976	93.82	100.95	101.13	101.01	92.88	92.9	92.77	100.2
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	94.52	101.98	100.53	101.49	93.13	92.7	94.02	98.6
1979	101.84	102.60	100.79	101.98	99.86	99.3	101.05	98.2
1980	111.85	97.17	103.44	99.31	112.63	115.1	108.13	106.5
1981	116.97	98.36	104.92	100.60	116.28	118.9	111.49	106.7
1982	119.60	91.80	107.92	97.30	122.92	130.3	110.82	117.6
1983	119.36	95.08	111.58	100.71	118.53	125.5	106.98	117.3

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

16. Manufacturing -- Pulp and Paper Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	74.19	99.94	81.13	94.22	78.74	74.2	91.4	81.2
1971	78.58	96.99	82.08	92.45	85.00	81.0	95.7	84.6
1972	87.80	99.52	83.33	94.60	92.81	88.2	105.4	84.6
1973	98.20	101.94	84.91	96.76	101.48	88.2	115.7	83.7
1974	99.29	100.54	88.36	96.84	102.54	98.8	112.4	87.9
1975	82.94	90.31	91.82	90.77	91.38	91.8	90.3	101.7
1976	94.56	96.70	95.91	96.46	98.03	97.8	98.6	99.2
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	102.24	100.99	104.40	102.03	100.21	101.2	97.9	103.4
1979	105.19	101.30	110.79	104.19	100.97	103.8	95.0	109.4
1980	98.95	98.43	116.70	103.99	95.16	100.5	84.8	118.6
1981	100.01	98.06	120.44	104.87	95.37	102.0	83.0	122.8
1982	97.70	93.13	122.33	102.00	95.78	104.9	79.9	131.4
1983	110.78	93.21	124.21	102.53	107.94	118.9	89.2	133.3
				JAPAN				
1970	72.02	114.87	54.38	87.89	81.94	62.7	132.45	47.3
1971	78.67	115.86	61.21	91.49	85.99	67.9	128.52	52.8
1972	91.12	109.63	69.10	91.56	99.52	83.1	131.86	63.0
1973	98.08	112.18	75.96	96.03	102.14	87.4	129.12	67.7
1974	87.28	104.25	82.24	94.43	92.42	83.7	106.13	78.9
1975	87.96	95.04	89.87	92.74	94.85	92.5	97.87	94.6
1976	105.09	101.13	94.65	98.24	106.98	103.9	111.04	93.6
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	107.58	97.17	104.82	100.58	106.96	110.7	102.64	107.9
1979	118.09	97.24	109.89	102.88	114.78	121.4	107.46	113.0
1980	104.49	95.12	116.32	104.58	99.91	109.8	89.83	122.3
1981	120.58	96.68	121.22	107.63	112.04	124.7	99.47	125.4
1982	125.43	99.15	124.70	110.55	113.46	126.5	100.58	125.8
1983	131.18	99.15	129.00	112.47	116.64	132.3	101.69	130.1

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

17. Manufacturing -- Chemicals Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	68.76	97.94	77.00	89.82	76.56	70.2	89.3	78.6
1971	72.95	94.49	78.50	88.29	82.63	77.2	92.9	83.1
1972	79.87	94.37	79.33	88.53	90.21	84.6	100.7	84.1
1973	87.64	97.09	80.83	90.78	96.54	90.3	108.4	83.3
1974	85.45	98.54	84.83	93.22	91.66	86.7	100.7	86.1
1975	85.00	93.29	89.17	91.69	92.70	91.1	95.3	95.6
1976	95.15	96.88	94.00	95.77	99.35	98.2	101.2	97.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	103.26	102.51	104.17	103.15	100.11	100.7	99.1	101.6
1979	108.99	103.92	108.73	105.79	103.03	104.9	100.2	104.6
1980	104.48	103.08	112.25	106.64	97.98	101.4	93.1	108.9
1981	108.57	102.87	115.33	107.71	100.80	105.5	94.1	112.1
1982	102.39	98.57	117.50	105.91	96.68	103.9	87.1	119.2
1983	108.93	97.02	119.17	105.61	103.14	112.3	91.4	122.8
				JAPAN				
1970	50.24	112.75	59.30	84.10	59.74	44.6	84.73	52.6
1971	62.98	109.63	67.76	87.18	72.23	57.4	92.94	61.8
1972	76.21	109.63	75.00	91.06	83.69	69.5	101.62	68.4
1973	77.90	109.18	80.39	93.75	83.09	71.3	96.89	73.6
1974	78.18	108.02	85.96	96.20	81.27	72.4	90.95	79.6
1975	75.04	104.37	93.25	98.41	76.25	71.9	80.47	89.4
1976	84.72	107.93	96.62	101.87	83.17	78.5	87.69	89.5
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	122.17	94.42	103.69	99.39	122.92	129.4	117.82	109.8
1979	123.38	96.28	107.14	102.10	120.84	128.1	115.16	111.3
1980	121.38	102.14	109.89	106.29	114.19	118.8	110.45	107.6
1981	132.78	99.89	115.66	108.34	122.56	132.9	114.80	115.8
1982	149.39	98.04	119.33	109.45	136.49	152.4	125.19	121.7
1983	170.28	98.04	124.79	112.38	151.53	173.7	136.46	127.3

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

18. Manufacturing -- Primary Metals Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	103.06	104.42	88.81	100.79	102.25	98.7	116.0	85.0
1971	100.39	96.53	89.79	94.96	105.72	104.0	111.8	93.0
1972	107.07	99.70	90.35	97.52	109.80	107.4	118.5	90.6
1973	125.91	109.01	91.33	104.89	120.03	115.5	137.9	83.8
1974	127.43	109.90	93.85	106.16	120.03	115.9	135.8	85.4
1975	96.05	93.66	95.80	94.16	102.00	102.5	100.3	102.3
1976	100.04	96.50	97.90	96.83	103.32	103.7	102.2	101.5
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	109.11	104.35	101.96	103.79	105.12	104.6	107.0	97.7
1979	113.31	106.94	104.55	106.00	106.89	106.4	108.4	98.2
1980	101.23	93.83	106.57	96.80	104.58	107.9	95.0	113.6
1981	103.27	92.89	108.53	96.54	106.97	111.2	95.1	116.8
1982	73.97	72.85	109.65	81.43	90.85	101.5	67.5	150.5
1983	77.45	68.91	110.07	78.50	98.66	112.4	70.4	159.7
				JAPAN				
1970	63.80	119.05	52.82	80.64	79.12	53.6	120.79	44.4
1971	72.44	117.10	60.80	84.45	85.78	61.9	119.14	51.9
1972	83.17	114.66	69.36	88.39	94.09	72.5	119.90	60.5
1973	94.96	115.65	74.86	91.99	103.23	82.1	126.85	64.7
1974	84.80	112.45	80.27	93.79	90.42	75.4	105.65	71.4
1975	86.61	101.31	86.11	92.50	93.63	85.5	100.57	85.0
1976	99.67	99.43	92.27	95.28	104.61	100.2	108.02	92.8
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	103.94	93.91	102.39	98.83	105.17	110.7	101.51	103.0
1979	126.07	94.16	105.21	100.57	125.36	133.9	119.83	111.7
1980	130.23	97.95	106.51	102.91	126.54	132.9	122.27	108.7
1981	112.42	93.32	109.06	102.45	109.73	120.5	103.07	116.9
1982	116.53	93.32	112.17	104.26	111.78	124.9	103.89	120.2
1983	100.88	93.32	115.71	106.31	94.89	108.1	87.18	124.0

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

19. Manufacturing -- Fabricated Metals Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	85.35	97.87	76.42	93.39	91.39	87.2	111.7	78.1
1971	81.67	92.49	78.17	89.50	91.25	88.3	104.5	84.5
1972	89.87	98.20	80.35	94.47	95.13	91.5	111.9	81.8
1973	99.97	105.73	84.28	101.24	98.74	94.6	118.6	79.7
1974	90.36	103.00	88.65	100.00	90.36	87.7	101.9	86.1
1975	81.32	90.57	92.14	90.90	89.46	89.8	88.3	101.7
1976	92.05	95.30	95.63	95.37	96.52	96.6	96.3	100.4
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	104.39	105.44	105.24	105.40	99.04	99.0	99.2	99.8
1979	110.30	107.85	111.35	108.58	101.59	102.3	99.1	103.2
1980	103.85	100.30	116.90	103.77	100.07	103.5	88.8	116.5
1981	103.70	98.30	122.71	103.40	100.29	105.5	84.5	124.8
1982	93.46	86.43	125.76	94.65	98.74	108.1	74.3	145.5
1983	99.86	86.13	126.64	94.60	105.57	115.9	78.9	147.0
				JAPAN				
1970	88.81	115.72	46.25	105.44	84.23	76.7	192.02	40.0
1971	91.87	113.02	55.04	104.44	87.96	81.3	166.90	48.7
1972	103.98	111.89	62.84	104.63	99.38	92.9	165.46	56.2
1973	130.47	116.28	72.52	109.81	118.82	112.2	179.92	62.4
1974	106.20	110.36	81.61	106.10	100.09	96.2	130.13	73.9
1975	84.97	98.59	87.21	96.91	87.68	86.2	97.43	88.5
1976	89.15	99.40	93.42	98.51	90.49	89.7	95.43	94.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	115.35	100.78	105.87	101.54	113.60	114.5	108.96	105.0
1979	123.30	103.63	114.57	105.25	117.15	119.0	107.62	110.6
1980	126.44	107.83	125.23	110.40	114.53	117.3	100.96	116.1
1981	129.48	104.80	135.90	109.40	118.36	123.6	95.27	129.7
1982	135.12	104.80	146.23	110.93	121.81	128.9	92.40	139.5
1983	136.69	108.83	153.73	115.47	118.38	125.6	88.92	141.3

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

20. Manufacturing -- Machinery (Except Electric) Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	77.33	91.03	74.22	86.93	88.95	84.9	104.2	81.5
1971	71.99	82.46	76.39	80.98	88.90	87.3	94.2	92.6
1972	81.50	88.64	79.04	86.29	94.44	91.9	103.1	89.2
1973	92.21	99.28	82.41	95.16	96.90	92.9	111.9	83.0
1974	94.23	103.30	87.23	99.38	94.82	91.2	108.0	84.4
1975	85.89	93.85	91.08	93.18	92.18	91.5	94.3	97.1
1976	92.81	94.70	94.70	94.70	98.00	98.0	98.0	100.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	107.88	108.38	106.51	107.92	99.96	99.5	101.3	98.3
1979	115.53	114.91	115.21	114.99	100.47	100.5	100.3	100.3
1980	116.69	114.02	123.13	116.25	100.38	102.3	94.8	108.0
1981	125.19	113.23	131.08	117.58	106.47	110.6	95.5	115.8
1982	113.59	100.13	137.35	109.21	104.01	113.4	82.7	137.2
1983	108.85	92.97	142.89	105.15	103.52	117.1	76.2	153.7
				JAPAN				
1970	74.99	114.46	56.57	103.12	72.73	65.5	132.58	49.4
1971	77.97	112.16	65.45	103.01	75.69	69.5	119.12	58.4
1972	77.66	109.30	73.21	102.23	75.97	71.1	106.09	67.0
1973	85.65	114.59	79.47	107.70	79.52	74.7	107.78	69.3
1974	87.33	112.19	86.71	107.20	81.47	77.8	100.71	77.3
1975	82.61	96.42	93.05	95.76	86.27	85.7	88.79	96.5
1976	96.00	99.13	97.19	98.75	97.22	96.8	98.78	98.0
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	111.14	96.35	103.04	97.66	113.80	115.3	107.86	106.9
1979	122.79	99.21	107.90	100.91	121.69	123.8	113.80	108.8
1980	142.21	103.73	114.58	105.86	134.35	137.1	124.12	110.5
1981	159.16	102.64	126.08	107.24	148.41	155.1	126.23	122.8
1982	169.44	102.64	136.72	109.32	154.99	165.1	123.93	133.2
1983	179.52	105.75	144.60	113.37	158.35	169.7	124.14	136.7

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

21. Manufacturing -- Electrical Machinery Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	73.24	98.32	77.78	93.28	78.52	74.5	94.2	79.1
1971	73.97	92.11	80.34	89.23	82.90	80.3	92.1	87.2
1972	83.08	96.76	82.48	93.26	89.08	85.9	100.7	85.2
1973	90.67	104.95	86.75	100.49	90.23	86.4	104.5	82.7
1974	83.99	103.25	91.88	100.47	83.60	81.3	91.4	89.0
1975	77.84	88.95	93.59	90.08	86.41	87.5	83.2	105.2
1976	86.78	93.50	96.15	94.15	92.18	92.8	90.3	102.8
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	113.63	106.62	105.56	106.36	106.83	106.6	107.6	99.0
1979	121.36	112.27	114.03	112.71	107.68	108.1	106.4	101.6
1980	128.00	109.91	123.80	113.31	112.97	116.5	103.4	112.6
1981	133.06	110.45	132.48	115.85	114.86	120.5	100.4	119.9
1982	130.17	104.50	140.17	113.24	114.95	124.6	92.9	134.1
1983	137.24	107.93	147.44	117.61	116.69	127.2	93.1	136.6
				JAPAN				
1970	37.90	106.44	60.94	88.51	42.82	35.6	62.19	57.2
1971	41.78	102.67	66.68	88.49	47.21	40.7	62.65	64.9
1972	55.50	104.47	71.63	91.53	60.63	53.1	77.48	68.6
1973	71.74	111.32	79.50	98.78	72.62	64.4	90.24	71.4
1974	72.98	100.27	86.22	94.73	77.04	72.8	84.65	86.0
1975	64.17	92.55	89.46	91.34	70.25	69.3	71.73	96.7
1976	87.85	99.80	93.18	97.19	90.39	88.0	94.29	93.4
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	119.38	102.22	105.83	103.64	115.18	116.8	112.80	103.5
1979	148.61	105.77	115.38	109.56	135.65	140.5	128.80	109.1
1980	197.54	115.42	129.27	120.88	163.43	171.2	152.81	112.0
1981	234.59	123.54	144.55	131.82	177.96	189.9	162.29	117.0
1982	278.57	126.88	161.46	140.50	198.27	219.6	172.54	127.3
1983	349.46	133.56	178.82	151.39	230.83	261.7	195.43	133.9

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

22. Manufacturing -- Transportation Equipment Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	63.12	93.96	77.64	90.08	70.07	67.2	81.3	82.6
1971	70.64	90.35	78.38	87.50	80.73	78.2	90.1	86.8
1972	76.67	94.03	82.31	91.24	84.03	81.5	93.1	87.5
1973	88.38	102.07	85.75	98.19	90.01	86.6	103.1	84.0
1974	80.34	95.31	89.93	94.03	85.44	84.3	89.3	94.4
1975	76.67	87.26	91.89	88.36	86.77	87.9	83.4	105.3
1976	90.16	94.06	94.59	94.19	95.72	95.8	95.3	100.6
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	104.15	106.08	106.14	106.09	98.17	98.2	98.1	100.1
1979	98.71	107.20	114.51	108.94	90.60	92.1	86.2	106.8
1980	79.59	96.83	122.17	102.86	77.37	82.2	65.1	126.2
1981	79.97	97.20	132.19	105.53	75.78	82.3	60.5	136.0
1982	73.08	88.97	138.08	100.66	72.60	82.1	52.9	155.2
1983	85.61	93.27	142.26	104.93	81.58	91.8	60.2	152.5
				JAPAN				
1970	60.15	94.78	53.01	79.78	75.39	63.5	113.47	55.9
1971	60.01	97.16	60.44	83.97	71.47	61.8	99.30	62.2
1972	62.28	98.34	68.34	87.57	71.12	63.3	91.14	69.2
1973	74.40	103.41	77.69	94.17	79.00	71.9	95.76	75.1
1974	84.15	100.88	86.11	95.58	88.04	83.4	97.72	85.4
1975	81.14	94.59	91.55	93.50	86.78	85.8	88.64	96.8
1976	90.76	94.65	94.91	94.75	95.80	95.9	95.63	100.3
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	104.93	99.83	105.85	101.99	102.88	105.1	99.14	106.0
1979	116.09	101.38	111.32	104.95	110.62	114.5	104.29	109.8
1980	134.15	100.21	120.64	107.54	124.74	133.9	111.20	120.4
1981	141.86	100.35	131.50	111.53	127.19	141.4	107.88	131.0
1982	142.58	96.91	142.80	113.38	125.75	147.1	99.85	147.4
1983	153.47	103.16	151.08	120.36	127.51	148.8	101.58	146.5

APPENDIX
Table 3

Indexes of Real Output; Inputs; Productivities; and Capital/Labor Ratio
United States and Japan, 1970-83

23. Manufacturing -- Other Manufacturing Industries Group

Year	Real Output	Labor Input	Capital Input	Total Factor Input	Productivity Ratios			Capital/Labor Ratio
					Tot. Fact.	Labor	Capital	
				UNITED STATES				
1970	77.58	94.32	78.26	89.07	87.10	82.3	99.1	83.0
1971	79.89	93.66	80.50	89.36	89.41	85.3	99.2	86.0
1972	88.16	98.83	83.68	93.88	93.91	89.2	105.4	84.7
1973	96.23	102.75	87.13	97.64	98.55	93.7	110.4	84.8
1974	93.08	99.68	91.14	96.89	96.07	93.4	102.1	91.4
1975	88.32	89.87	93.84	91.17	96.87	98.3	94.1	104.4
1976	94.50	95.44	96.74	95.86	98.58	99.0	97.7	101.4
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0
1978	105.05	102.19	104.46	102.93	102.06	102.8	100.6	102.2
1979	106.16	105.28	110.48	106.98	99.24	100.8	96.1	104.9
1980	102.18	100.44	115.39	105.33	97.01	101.7	88.5	114.9
1981	105.32	100.36	119.87	106.74	98.67	104.9	87.9	119.4
1982	100.53	93.92	122.85	103.38	97.24	107.0	81.8	130.8
1983	106.30	97.58	125.00	106.55	99.77	108.9	85.0	128.1
				JAPAN				
1970	77.21	96.66	51.21	84.03	91.88	79.9	150.76	53.0
1971	80.07	99.38	59.11	88.19	90.79	80.6	135.46	59.5
1972	90.08	102.14	67.35	92.47	97.41	88.2	133.74	65.9
1973	94.73	106.67	75.56	98.02	96.64	88.8	125.36	70.8
1974	87.71	101.16	82.91	96.09	91.28	86.7	105.79	82.0
1975	86.82	94.27	88.59	92.69	93.66	92.1	98.00	94.0
1976	97.02	99.90	94.49	98.39	98.61	97.1	102.68	94.6
1977	100.00	100.00	100.00	100.00	100.00	100.0	100.00	100.0
1978	107.38	101.25	104.85	102.25	105.03	106.1	102.42	103.6
1979	106.65	102.77	110.86	105.01	101.55	103.8	96.20	107.9
1980	112.79	103.03	118.62	107.36	105.06	109.5	95.09	115.1
1981	119.82	103.69	127.64	110.35	108.58	115.6	93.87	123.1
1982	123.30	103.51	135.41	112.38	109.72	119.1	91.06	130.8
1983	123.49	104.56	142.61	115.14	107.26	118.1	86.59	136.4

* Includes apparel; lumber; furniture; printing & publishing; petroleum; rubber; stone, clay & glass; leather; instruments; and miscellaneous manufactures.